1480 dd 21

ASTRONOMY;

Or, The TRUE
SYSTEM of the *PLANETS*
DEMONSTRATED.

Wherein are ſhewn by *INSTRUMENT*,
Their Anomalies, Heliocentrick and Geocentrick Places both
in Longitude and Latitude; their Aphelions,
Perihelions, Retrogradations and Elongations, Parallaxes and
Diſtances from the Sun and Earth: With the Method
of Computing the Times when *Venus* and *Mercury* may be
ſeen in the Sun's Disk. Alſo the Moon's Phaſes, and Eclipſes
of the Luminaries, for any time paſt, preſent, or to
come. With proper Cuts to each Planet: By which any
Perſon may in a few Hours, and with great Eaſe, attain
to a perfect Knowledge of the Planetary, or Solar System.

LIKEWISE

The Places of the Heavenly Bodies and Motion of the
EARTH are not only ſhewn, but plainly and ſuccinctly demonſtrated
to the Meaneſt Capacity, by Short and Eaſie Rules and NEW
Aſtronomical TABLES. With the Places of 130 Principal Fixed
Stars, 33 of which lye in the Moon's Way: Deſign'd as a Help towards
diſcovering the Longitude at Sea.

To which is prefix'd, an Alphabetical Catalogue of as
many TERMS in Aſtronomy as are moſt Uſeful, and neceſſary
to be underſtood. A WORK entirely New, and in a Method
hitherto unattempted.

By *CHARLES LEADBETTER*, Teacher of the
Mathematicks.

LONDON,
Printed for J. Wilcox in *Little Britain*; and T. Heath,
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the *Strand*. MDCCXXVII.

13 JUN 58

TO

Mrs. *Catherine Edwin.*

Honoured Madam,

BEING credibly inform'd of your great Learning and Skill in the *Mathematical Sciences*, eſpecially in the Celeſtial One, I am embolden'd and encourag'd to Dedicate to You this Small TRACT. Your Condeſcenſion to be its Patroneſs, is my peculiar Happineſs: For as a Traveller, who in a ſtrange Countrey, paſſes the ſafer on his Way, when he hath a good Guard or Convoy; ſo I do not in the leaſt queſtion, but that this Book, having Your Worthy Name prefix'd, will paſs current, and receive the Approbation of all who profeſs the Noble Study of *Aſtronomy*.

Madam, I will not detain you any longer from your more important Affairs: But, avoiding Prolixity, ſhall wholly depend on your Goodneſs to pardon the Boldneſs and Preſumption of this Dedication. And, that God, the Great Architect of the Univerſe, would bleſs You with Long and Happy Days in this Life, and with a Crown of Eternal Glory in that which is to come, are, and ſhall be the Hearty Prayers of,

MADAM,

Your Moſt Obedient, and

Moſt Humble Servant,

Cha. Leadbetter.

To the Candid and Judicious

READERS.

GENTLEMEN,

IN all Ages and Countries, where LEARNING has prevail'd, the *Mathematical Science* hath been look'd upon as one of its moſt conſiderable Branches. And amongſt the Seven Liberal Arts, no leſs than Four of them are Mathematical, *viz. Arithmetick*, *Geometry*, *Muſick* and *Aſtronomy*.

IT is my Opinion, no Age ſince the Beginning of Time, ever produced ſo many Mathematicians as this we live in: And if there were Encouragement, (I am perſuaded) they would out-do all that ever went before; the Ambition of Men being ſuch, that they endeavour to excel one another. One Man's Genius leads him to Clerkſhip, another's to Numbers and Geometry, (thoſe indeed being the Foundation of all,) a third takes delight in Algebra, and ſolving critical Queſtions; ſome again, apply themſelves ſtrictly to Architecture, Surveying or Dialling, whilſt others endeavour to qualifie themſelves for Gaugers, and the Management of the Publick Revenues; and others for Navigation, and ſo become Commanders of Ships, and bring us home the Riches of the *Indies*.

And thus, whilſt the Generality of Men are grovelling upon this Lower World, the more refin'd Part of Mankind are looking upward, and there, with the Royal Pſalmiſt, cry out, *Oh Lord! there is no Work like unto thy Works; for thou art great, and doſt wondrous things.* Indeed, there is room enough in the Mathematical Sciences to entertain the Minds of all Men: And, as there is no Part more Excellent, ſo there is none more difficult than this of Astronomy, *viz.* the *Theory of the Planets*, to determine their Diſtances and Orbs by Obſervation; to deſcribe and conſtruct the Tables of their Motions; and to ſhew the Uſes of them in finding the Places of the Planets; the Eclipſes of the Luminaries; the Appulſes of the Planets to Fixed Stars, the Immerſions and Emerſions of the Satellites of *Saturn* and *Jupiter*, with the Tranſits of *Venus* and *Mercury* over the Sun's Disk, *&c.* And this, I ſay, is the very *Achme* or Summit of all Human Knowledge. This gives us an Idea of the Deity, to view the ſtupendious Canopy of Heaven, to raiſe our Heads aloſt, in Contemplation, to that almoſt infinite Extenſion of the Starry Firmament: And when we are there, if we have lived a good and pious Life here below, our Souls want but a Step or two, to penetrate into the Abodes of the Bleſſed.

Astronomy hath for ſome Thouſands of Years paſt been much ſtudied, even by Men of the Firſt Rank: For *Richard* the Second, King of *England*, wrote ſomething this way, which is now extant in his Majeſty's Library at St. *James's*.

This Study has generally been carried on with a great Expence of Treaſure, to the Perfection in which we now enjoy it. It is recorded of *Alphonſus* X. King of *Caſtile*, that he ſpent no leſs than 400000 Crowns in the Inſtauration of his Aſtronomical Tables, which he firſt publiſhed in the Year of Chriſt 1252. And the Sagacious, the Noble *Tycho Brahe* is ſaid to have expended half that Sum in the Proſecution of this Study. He flouriſh'd in the Year 1572, and Rectified 780 of the Fixed Stars, to the Year 1601, the Landgrave of *Heſſe* 386, *Hevelius* 1534. But our indefatigable *Flamſteed* has out-done them all; for his *Britiſh* Catalogue contains near 3000 of the Fixed Stars, Rectified to the Year 1726, as may be ſeen in the Third Volume of his *Hiſtoria Cœleſtis.* The moſt Renowned Aſtronomers of Foreign Countries who flouriſhed in the laſt and this Age, were *Copernicus*, *Reticus*, from whom I borrow the Rotation of *Mercury's Axis*; the Prince of *Heſſe*, the Noble *Tycho Brahe*, *Kepler*, *Bulialdus*, *Ricciolus*, *Hevelius*, *Caſſini*, and *Hugens.* But thoſe of our own Nation, which are of more particular Note, are, the Right Honourable the Earl of *Sandwich*, in the Reign of King *Charles* II. Dr. *Seth Ward*, Biſhop of *Sarum*, Sir *Iſaac Newton*, *John Newton*, D.D. Sir *Chriſtopher Wren*, *N. Mercator*, Sir *Jonas Moor*, the two *Townleys*, Mr. *Horrox*, Mr. *Crabtree*, (theſe five laſt were *Lancaſhire* Gentlemen;) Mr. *Caſcoygne*, Mr. *Laurence Rook*, Dr. *Hook*, Dr. *Gregory*, the Reverend Mr. *Flamſteed*, Aſtronomer-Royal, Dr. *Edmond Halley*, Aſtronomer-Royal, Dr. *Keil*, the Reverend Mr. *Pound*, the two ingenious *Wings*, Mr. *Jeremy Shackerley*, the celebrated Mr. *Tho. Street*, the Learned Mr. *Whiſton*, and Mr. *James Hodgſon*, Maſter of the Royal Mathematical School, *London*. Theſe are all Lights of the firſt Magnitude, in the Northern Hemiſphere, who by their Learned Works have regiſtred their Names in the Book of Fame, which may ſtand as long as the Stars in the Firmament of Heaven.

PARDON, good Reader, this Digreſſion, and give me leave now to acquaint you with the Deſign and Contents of the following Work.

My Deſign in this Tract is therefore to Abbreviate the Calculative Part of the Planets Places in Longitude and Latitude, and to ſhew the Eclipſes by Inſpection; which will beſt appear, by comparing the Work in each Planet with the Calculations of *Venus*'s Places in Pages 48, 49, 50, 51, *&c.* which are perform'd the common Way, from Aſtronomical Tables, *viz.* thoſe of the Learned Mr. *Wing* in his *Scientia Stellarum*, and thoſe of Mr. *Street*, being the only Numbers extant that we may depend on.

You have not only the Calculative Part as ſhort as may be, but alſo the Demonſtration of the Work; by which the Reader may know the reaſon of the common way of Calculating, altho' he was a perfect Stranger to it before. You have likewiſe the Earth's Motion, and Phaſes of the Moon made plain to you. You may in a Minute ſee at any New or Full Moon, whether there will be an Eclipſe, or not. You may at any time ſee, in what Part of the Orbits the Planets are; and whether they be Direct, Stationary or Retrograde. And becauſe this Book may fall into the Hands of ſome, who are unacquainted with Aſtronomy, for their ſakes I have explain'd as many Terms in this Science as are needful, and hope, the more Learned will pardon me for ſo doing. Next, you have the Signs, Planets, and Aſpects explained, and then, a View of the *Copernican*, or True Syſtem of the World; which I have diſſected, and of its Parts fram'd an Inſtrument for every Planet, which expeditiouſly ſolves the Phænomena, as near as is poſſible to be done in ſo ſmall a Radius. Then I give the Theory of every Planet, tho' ſhort, yet ſufficient for ſuch a Work: With an Example of working by the Inſtrument.

Then, in order to fit up the Inſtruments for Practice, you muſt take the Six large Schemes of *Saturn*, *Jupiter*, *Mars*, *Venus*, *Mercury*, and the *Moon*, out of the Book, and paſte them upon Boards well ſeaſon'd and plained; and to every one fit two Indexes, ſuch as is repreſented in *Plate* 10, *Figure* 16, one in every Planet's Inſtrument, to repreſent the Earth's Index; which you muſt mark with ⊖; and the other to repreſent the Planet's Index; in which you muſt have a Slit and Sliding-Nut, to anſwer at all times to the Planet's Eccentricity, as you may perceive in the Moon's Index, *Fig.* 14, and 15, by the Slit *a b*: But the Schemes mark'd *A B C* muſt be paſted on fine Paſteboard.

NEXT after the Theory of the Planets, and Uſe of their Inſtruments, come the Aſtronomical Tables; in which you have alſo a New Method of finding the Day of the Week, without knowing the Dominical Letter: And with theſe you have likewiſe Tables of the Planets Retrogradations, which will inform you, that the Superiours are always Oriental, and the Inferiours Occidental when they become Retrograde: And there you may ſee the Times between each Planet's Retrogradation, and how many Degrees they go back, Things worthy of Note, to compleat their Theories.

THE Table of the Equation of Natural Days is not Perpetual; becauſe the Tropical Year conſiſts but of 365 Days, 5 Hours, 48 Minutes, and 57 Seconds; and the *Julian* Year of 365 Days, 6 Hours. Hence it is, that after one Period of the Biſſextile Year, which is 4 Years, the Sun returns to the ſame Point in the Ecliptick 44 Minutes, 12 Seconds ſooner than he did before. Hence, and from the Præceſſion of the Equinoctial Points, it is, that the abſolute Equation of Time for the ſame Day of the *Julian* Year, is in a conſtant Flux, and is continually changing: But this Difference in an hundred Years amounts to no more than 23 Seconds; which is, in the Month of *June*, before the 5*th* Day to be ſubtracted, and after the 5*th* Day is to be added: Therefore the Difference

rence ſor an hundred Years being ſo ſmall, you may ſafely in things for common Uſe, neglect the ſaid Variation, and ſo the Table will ſerve you an Age without any ſenſible Error.

And as for the Inſtruments themſelves, which I have built upon the Aphelions of the Planets, if they have a Motion, it is ſo ſmall, that it will not be perceiv'd in the Inſtrument in an Age: But ſome Aſtronomers allow them no Motion at all; if ſo, then I am the ſafer; but with that Opinion I cannot acquieſce: If there were occaſion, I well know how to make the Inſtruments perpetual.

I have added, for the Uſe of the Mariner, 33 Fixed Stars that lye in the Moon's Way, rectified to the Beginning of the Year 1725, with ſome other Stars whoſe Longitude you may have to any other Year to come, by adding yearly 50 Seconds to their Longitudes in the Table; being deſigned for a Help in diſcovering the Longitude. And to make the Book more univerſal, I have added an Alphabetical Catalogue of ſome of the moſt principal Cities and Towns in the World, with their Difference of Longitude from *London*, collected from the Lateſt and Beſt Authors and Obſervations I could procure; and according to the Letters E or W, the Longitude there given being reduced into Time, and added or ſubtracted from the given Time at *London*, will reduce the Meridian of *London* to the Meridian of that Place, *& contrà*. And to reduce the Equal Time to the Apparent, or the Apparent to the Equal, the Table of Equation of Time is ſubſervient.

Lastly, You have an Account of the Fixed Stars, ſhewing what Star was the *Polar-Star* at the Creation of the World, with its Diſtance then, and now, from the *Pole-Arctick*, and how near to our Zenith the preſent *Polar-Star* will come, and the time when; together with a

General Rule to find the Declinations and Right Aſcenſions of the Planets and Fixed Stars for ever.

IT was in the Year 1674, that the famous Mr. *Tho. Street* publiſhed his *Planetary Syſtem*, in two large Schemes, with Directions for their Uſe (which came to my hands juſt as this Book was going to the Preſs;) but whether this Author in that Scheme made any Improvement in finding the Places of the Planets, will beſt appear to thoſe who ſhall make tryal of that Method.

AS the End of Writing is to inform others; ſo I have endeavour'd throughout the whole Work to deliver every thing as ſuccinct and plain as poſſible, that even the meaneſt Capacity may underſtand what he reads, and come to the Knowledge of the *Planetary*, or *Solar Syſtem*, without any other Book or Guide whatſoever.

FOR more than twenty Years laſt paſt I have been a diligent Obſerver of the Heavenly Bodies; in which time I have had the Happineſs to ſee Two of the greateſt Solar Eclipſes that has happen'd in any Age (that I know of) ſince the Beginning of Time; with Two Tranſits of *Mercury* over the Sun's Disk, and Two Conjunctions of *Saturn* and *Jupiter*: [When theſe happen'd, ſee my Treatiſe of *Eclipſes*.] And, as I have had the good luck to come as near the Mark as any Man, ſo I hope in this to out-do all that have done any thing in this way, (I mean, *Planetary Inſtruments*.) Here miſtake me not; for I am very far from being ſo vain, as to think, that no other Man could have hit upon the ſame Method beſides my ſelf. No! Far be that from me: For well knowing what a Learned Age and Nation we live in, had ſome of our Curious Gentlemen been pleaſed to have ſet themſelves about forming *Planetary Inſtruments*, I doubt not but they would have far out-done mine. 'Tis well known to our Aſtronomical

nomical Perſons, that Three of our own Nation hit upon the ſame thing at the ſame time, and unknown to each other; I mean, the Geometrical Conſtruction of Solar Eclipſes: And why may there not be ſome at this time alſo ſtudying ſomething this way, beſides my ſelf? If ſo, I ſhall be very glad to ſee any thing come abroad better done.

But I am afraid I ſhall tire my Reader's Patience with a too tedious Harangue: For where the Building is but ſmall, the Porch ought not to be great. Now what I have more to add, is, that I hope, the kind Reader will amend what Typographical Faults he ſhall meet with; and in the Interim I remain a Friend and Well-wiſher to all True Lovers of Aſtronomy,

Charles Leadbetter.

ADVER-

ADVERTISEMENT.

Astronomy *in all its Parts ; with other Parts of the Mathematicks, the Uſe of the Globes, Maps,* &c. *are carefully taught by this Author, at his Houſe the* Hand *and* Pen, *in* Cock-Lane *near* Shoreditch, London ; *or, at any Gentleman's Appartment. Alſo Land Survey'd and Mapp'd, Dials Delineated for any Latitude : With a New and Curious Method of fixing Horizontal Dials ; All at reaſonable Rates. All Perſons that write to him out of the Country about their own Buſineſs, are deſir'd to pay the Poſtage of their Letters, otherwiſe they may expect no Anſwer.*

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ERRATA.

PAGE 4. Line 30. read *with Continuance*; p. 5. l. 12. r. *Ecliptick*; p. 7. r. *Latus Rectum*; p. 11. l. 18. r. *Teleſcope*; p. 15. l. 10. r. *Sydereal*; p. 20. l. 24. r. *but in the Inferiours ♀ and ☿ the Earth's Orb is placed next to the Zodiack, and theirs within, next to the Sun.* p. 25. l. 16. r. *things*; p. 41. for ♂ r. ♄; p. 48. under *Anom.* ☉, and againſt *Mar.* 3. for 36′, r. 26′, and under *Node*, for 22′, r. 2′, and for 36′, r. 26′; p. 55. l. 9. for 1526, r. 1726; p. 56. l. 7. r. *Days* 15; p. 56, 57, 58, 59, l. 1. for *à*, r. *ab*; p. 61. l. 10. dele *and*; l. 13. r. *Example*; p. 68. l. 5. r. *but if both the Indexes lye together even one upon the other, then the Planet is in ☍ to ☉, and in Perigeon, and Retrograde*; p. 86. in *June*, after the *6th* Day, r. *Clocks too faſt, ſubt. from equal Time*; p. 105. l. 30. for ♍ r. ♏.

13 JUN 58

A/6

TERMS *Explained.*

A.

ANGLE, is the Interſection of two Lines: Or, the two Indexes of the Inſtrument not lying truly one upon another, make an Angle.

—— of Commutation, is made at the Sun.

—— of Elongation, is made at the Earth.

—— of Parallax of the Earth's Orbit, is made at the Planet; as the Inſtrument ſhews at large.

Anomalous *Conjunction*, is when the Two Planets *Saturn* and *Jupiter* are in Conjunction in *Piſces*, when in their Order, they ſhould have been in *Aries*; but were in *Piſces*, as in *Febr.* 1643.

Anomaly, from *Anomalia*, Inequality, Irregularity in Motion: But in the Inſtrument of every Planet, it is the Planet's Diſtance in Signs, Degrees and Minutes from the Aphelial Point.

Antecedentia, Things going before, in reſpect to the Diurnal Motion. In Aſtronomy, it ſignifies the ſame as Retrogradation, or the going back of the Planets out of *Aries* into *Piſces*, &c. in their Annual Motion.

Aphelion, from *Apo*, *from*, and *Helios*, the *Sun*; That Place in our Syſtem, in which the Planet is ſaid to be at its greateſt Diſtance from the Sun, and moves ſloweſt.

Apogeon, is when a Planet is at its greateſt Diſtance from the Earth's Center. The Moon in this Poſition moves ſloweſt.

Atmosphere, is the loweſt Part of the Region of the Air, or *Æther*, with which our Earth is encompaſs'd all round. That the Air is endowed with an Elaſticity, or Spring, is evident from Philoſophical Experiments (of which I have been an Eye-witneſs.) Hence it follows, that the Air in which we breathe, is reduced to the Denſity which it has near the [illegible], by the Preſſure of the ſuperincumbent Air; and that [illegible] more or leſs compreſs'd, according to the gr[illegible] leſſer

Weight of the Atmoſphere. For which reaſon alſo the Air is leſs denſe at the Top of a Mountain, or at four or five Miles high, than it is on the Earth's Surface, as being compreſs'd by a leſs Weight. A Fleece, or Pack of Wooll doth very well repreſent to us the Elaſticity or Spring of the Air. Its Height I have demonſtrated to be 47.12 *Engliſh* Miles, as you will find under the *Theory* of the Earth.

Auſtral, Of, or belonging to the South. Some Writers of *Ephemeris* note the South Latitude of a Planet with an A, ſignifying Auſtral, or South.

Azimuths (an Arabick Word) are great Circles of the Sphere, meeting in the *Zenith* and *Nadir* of any Place, and cutting the Horizon at Right Angles; the Number of them are infinite.

B.

B. ſtands for Biſſextile, or Leap-Year.

Boreal, of, or belonging to the North. So ſome Ephemeridiſts put B, to denote the North Latitudes of the Planets.

C.

Centrifugal Force, is that Force by which all Bodies which move round any other Body in a Circle, or an Ellipſis, do endeavour to fly off from the Axis of their Motion in a Tangent to the Periphery of it.

Centripetal Force, is that Force by which any Body moving round another, is drawn, or tends towards the Center of its Orbit; and is much the ſame with Gravity. Note, The Centrifugal Force of any Body to the Centripetal, is as the Square of the Arch which a Body deſcribes in a given time, divided by the Diameter, to the Square thro' which an heavy Body moves, in falling from a Place where it was at reſt in the ſame time. It is therefore by theſe two Forces being equal, that all the Heavenly Bodies are kept in their Orbits: For by the firſt they endeavour to fly off in Tangents; and by the latter they are bent towards the Center in a Curve, which is Elliptical.

Comets are what are commonly called *Blazing Stars.* The Ancients, eſpecially *Ariſtotle*, and his Followers, ſuppoſed them to be Meteors, or Exhalations, ſet on fire in the higheſt Region of the Air. The Modern Aſtronomers have found them to be above the Orbit of the Moon; but yet to deſcend ſo low, as to move in the Regions of the Planets. They appear moſt commonly with Tails, and the Tail is always turned from the Sun. They appear to us at the Earth to move Direct, and ſometimes Retrograde. The Periods of ſome of them that have been obſerv'd, are found to be pretty Regular; ſome compleating one Revolution in 75 Years and an half; others in 79, and others in 575 Years: And in their Motions they deſcribe Area's by Lines drawn from the Center of the Sun, proportional to the times, as do all the Planets; and that they move in Ellipſes, tho' ſome are very Excentric, and that they are alſo of the ſame Species with that of the Planets: And we can nearly tell the Return of as many as have been obſerv'd.

Commutation, is the Angle that is made by two Lines, the one drawn from the Earth, the other from the Planet, and meeting at the Sun.

Copernican; from *Nicholas Copernicus*, a Native of *Thorn* in *Poliſh Pruſſia*, born *Anno* 1473, and died *Anno* 1543, the Reviver of our Syſtem.

Consequentia, Following, in reſpect of the Diurnal Motion. In Aſtronomy 'tis when the Planets move forward, according to the Order of the Signs, from *Aries* to *Taurus*, &c. in their Annual Motion.

D.

Digit, the twelfth Part of the Sun's and Moon's Diameters made uſe of in the Eclipſes of the Sun and Moon. The Sun may apparently be ſome ſmall Quantity more than 12 Digits Eclipſed, if the Moon happen then in *Perigeon*, and the Sun in *Apogeon*: But the Moon may be 23 Digits Eclipſed; for all above 12, ſhew how far the Earth's Shadow is over the Body of the Moon.

Direct, the ſame with *Conſequentia*, which ſee. The Earth and Moon are always ſo.

Disk, from *Diſcus*, a Diſh or Platter: The round Phaſes or Faces of the Sun and Moon, at their great Diſtance from us, appear to us plain, flat, or like Diſhes. But the Disk of the Earth in the New Aſtronomy, is the Difference between the Horizontal Parallax of the Sun, and the Horizontal Parallax of the Moon; for that Difference at all times is equal to the Semidiameter of the Earth's Disk, demonſtrated by the Diagram of *Hipparchus*.

E.

Eccentrick-city, a Greek Word, from *Ec*, the Prepoſition, ſignifying *out of*, and *Kentron*, a *Center*; is the Diſtance between the *Focus* and Center of the Ellipſis, in which all the Planets move.

Eclipse, ſignifies a Deprivation of Light. The Eclipſe of the Sun, (or rather of the Earth) is cauſed by the Interpoſition of the Moon between him and our Sight, and can never happen, but only at the Conjunction, or *Interlunium*, when they are leſs than 18 Degrees diſtant, either before or after the Moon's Nodes: And of this there may be four ſorts, *viz.* 1. Partial; 2. Central and Annular; 3. Total, without Continuance; 4. Total, with Continuance.

1. Partial, is when ſome Part of the Sun's Body is obſcur'd by the Interpoſition of the Moon's Opaque Body between the Sun and the Eye of the Obſerver, in this the Digits muſt be leſs than 12.

2. Annular, is when at the Conjunction or *Interlunium*, the Moon happens near her Apogeon, and then the Sun is ſomewhere in the lower Part of his Orbit, towards his Perigeon; at which time the Sun's apparent Diameter will be conſiderably greater than the Moon's; and they being then apparently Concentrick, there will be ſeen a Ring of Light round the Moon's Body: And ſuch an Appearance *Clavius* obſerv'd at *Rome* on the *9th* Day of *April*, 1567.

3. Total without Continuance, is at the time of the Viſible Conjunction, the Moon's Center is ſeen in the Sun's Center, and their Viſible Diameters are equal; ſo that the Sun's Light no ſooner ſhuts in on the Eaſt Side, but Emerges on the Weſt Side of his Body: The Digits are in this juſt 12.

4. Total without Continuance, is when at the Viſible Central Conjunction, the Sun is in, or near his Apogeon, and the Moon her Perigeon. Here the Moon's apparent Diameter will be greater than that of the Sun; ſo that the Total Darkneſs will continue ſome few Minutes (never more than Five.) One of this ſort we had viſible at *London*, *Anno* 1715, *April* 22, ſix Minutes paſt 9 in the Forenoon. [See my Treatiſe of Eclipſes] The Sun's Eclipſe is only Viſible to that Part of the Earth upon which the Moon's Shadow falls; and what is ſaid above, is in reſpect to particular Places of the Earth: And as to any particular Place on the Earth, the Total Duration can ſcarce

exceed 2 ¼ hours. To theſe may be added, the General *Pænomena* of a Solar Eclipſe, which conſiders the Paſſage of the *Penumbra* over the Earth's Disk, which in time will often amount to more than Five Hours. But theſe things I have reſerv'd for another Work.

The Moon's Eclipſe is caus'd by the Interpoſition of the Earth between the Sun (the Fountain of Light and Heat) and Moon, which can never happen but at the Full Moon, and when ſhe is within 12 Degrees of either Node: For if the Moon's Orbit lay in the Plane of the Ecliptick, there would be a Solar and a Lunar Eclipſe at every Change and Full Moon; But theſe two great Circles making an Angle of 5 Degrees at Full and Change, is the Cauſe why we have ſometimes a Partial, and at other times a Total Eclipſe: For the Quantity depends purely upon the Diſtance of the Luminary from the Nodes; and the Moon being an Opaque Body, ſhining only with a borrow'd Light, is depriv'd of that Light when ſhe falls into the Earth's Shadow: And this can never happen, if the Full Moon fall more than 12 Degrees from her Nodes.

The Moon's Eclipſe is General and Univerſal, as to its Quantity and Duration; becauſe the Moon doth really loſe her borrow'd Light, by being Immerſed into the Earth's Shadow: But then ſhe does not become quite Inviſible, but appears of a dark brown Hue; and this is occaſion'd by our Atmoſphere, which ſurrounds our Earth equally on every ſide; and therefore its *Penumbra* terminates in a Point at a ſmall diſtance beyond that of the Cone of the perfect Shadow of our Earth, ſurrounding that Cone equally alſo on every ſide, and by the Rays of Light in our Atmoſphere we come to ſee the Body of the Moon in a Total Eclipſe.

There can never be leſs than Two, nor more than Six Eclipſes of the Sun and Moon in one Year; and when Two, they are always of the Sun: For the Sun ſtands a fairer Chance of being Eclipſed, than the Moon doth; becauſe his Ecliptick Boundaries are 18 Degrees, and the Moon's but 12 Degrees. When two of the Sun in one Year only happen, one of them is always before his Apogeon, and the other after.

There are three ſorts of Lunar Eclipſes, *viz.* 1. Partial; 2. Total without Continuance; 3. Total with Continuance.

1. Partial, is when ſome Part of the Moon's Diameter, or Body falls within the Earth's Shadow; and this always happens when the Sum of the Moon's Latitude and her Semidiameter are greater than the Semidiameter of the Earth's Shadow; the Digits are always leſs than 12.

2. Total without Continuance, is when all the Moon's Diameter or Body falls within the Earth's Shadow. Here the Sum of the Moon's Latitude and her Semidiameter are equal to the Semidiameter of the Earth's Shadow: ſo that ſhe is no ſooner all Immerſed within the Shadow, but the ſame Moment ſhe Emerges on the ſame ſide of her Body again; and this is common to both the North and South ſide of her Body: For if ſhe have North Latitude, the North Part of her Body is firſt enlighten'd; but if South Latitude, then the South Part. The Digits here are juſt 12.

3. Total with Continuance, is when all the Moon's Body falls within the Shadow, and continues ſome time therein: And this always happens when the Sum of the Moon's Latitude and her Semidiameter is leſs than the Semidiameter of the Earth's Shadow: For if the Cone of the Shadow through which the Moon paſſes, be cut by a Plane parallel to the Baſe of the Cone, that Section will be a Circle, and is almoſt three times greater than the Diameter of the Moon at that time. Here the Digits are more than 12. *See Digits.*

EGYPTIAN SYSTEM, is that which is mention'd by *Vitruvius*, *Martianus*, *Capella*, *Macrobius*, *Beda* and *Argol*. Theſe place the Earth in the Center of the Univerſe; next above, is the Moon, then the Sun, and *Mercury* and *Venus* moving in Epicycles round him; next above them is *Mars*; then they plac'd *Jupiter*, then *Saturn*, and above all the Planets, the Fixed Stars, all moving round the Earth: But this, by Telleſcope-Obſervations, is found to be falſe, and therefore 'tis exploded.

ELONGATION, is the Diſtance of a Planet from the Sun, either before or after him; and in the Inſtrument, is the Angle that is made at the Earth by two Lines, the one drawn to the Sun, and the other to the Planet; and when *Venus* and *Mercury* are in Aphelion, this Angle is the greateſt, and leaſt in Perhelion.

Emersion, is the time when any Planet that is Eclips'd, begins to recover its Light.

Equation, in the Motions of the Planets, is the difference between their true and mean Place; and from the Aphelion to the Perihelion, that is, from 0 to 6 Signs, it is to be ſubſtracted: But from the Perihelion to the Aphelion, that is from 6 to 0, or 12 Signs of mean Anomaly, it is to be added, and the Sum or Difference is the Planet's true Heliocentrick Place.

Equinoctial in the Heavens, or **Equator** on the Earth, is an imaginary great Circle of the Sphere, which divides it into two equal Parts, every 15 Degrees of which is an Hour of time; and to which when the Sun apparently comes, makes Equal Day and Night.

Explode. To hiſs off the Stage; that is, any thing that doth not agree with ſound Philoſophy, or that will not bear a Mathematical Demonſtration, is ſaid to be Exploded.

F.

Focus, the Navel, or two Center-Points in an Ellipſis, *viz.* where the *Latera Recta* interſect the tranſverſe Diameter; upon the Lower the Sun is fix'd in the Syſtem of all the Planets, and the Earth in the Moon's Syſtem.

G.

Galilæus, a *Florentine*, who flouriſh'd in the Year 1615. He was the firſt that apply'd the Belgick Proſpective Glaſs, by him meliorated (or made better) for Celeſtial Objects; by which he diſcover'd that *Jupiter* was inviron'd with four ſmaller Stars or Planets, now call'd his *Satellites:* And by it he alſo diſcover'd the diſtant Phaſes of *Saturn*, and his *Anſæ*, or Ear-rings; that *Venus* had her Increaſe and Waining; and that the Disk was like our Earth, riſing with Mountains, and depreſs'd into Valleys and Seas; that the Sun had its Spots: By which likewiſe he evinc'd that it had a Rotation upon its own Axis; and that the *Via Lactea* was nothing but a Multitude of ſmall Stars, all of the ſame ſort or kind.

Geocentrick, from the two Words, *Ge*, the Earth, and *Kentron*, the Center; in the Place of any Planet is, as it is really beheld from the Earth, in reſpect of either Longitude or Latitude.

HORIZON, is one of the ſix great Circles of the Sphere, which divides it into two equal Parts, ſeparating things ſeen from things not ſeen, to which when the Sun or Star comes, it is ſaid to Riſe and Set.

HYPOTHESIS, the ſame with *Syſtem*, which ſee.

I.

IMMERSION of a Star, when it approacheth ſo near the Sun as to be hid in its Beams. The Beginning of an Eclipſe is alſo ſo called, when it begins to be obſcur'd; As alſo the Satellites of *Jupiter*, when they enter into his Shadow, is call'd the *Immerſion.*

INCLINATION, is the Angle that the Orbs of the Planets make with the Ecliptic, and is the ſame with the Heliocentric Latitude.

INTERLUNIUM, when the Moon has no Face, as being in Conjunction with the Sun, *(i. e.)* New Moon.

L.

LATITUDE, Breadth; but of a Star or Planet it is its Diſtance from the Ecliptic; and as ſeen from the Earth, it is call'd the Geocentric Latitude; but as it would appear from the Sun, the Heliocentric Latitude; and may be either North or South, in quantity, according to its Diſtance from the Node.

LONGITUDE, Length; but in Aſtronomy it is the Diſtance of a Planet from the Beginning of *Aries*, reckoning according to the Order of the Signs, from *Aries* to *Taurus*, &c.

M.

MEAN, or *Middle Motion* of a Planet, is, ſuppoſing it to move in a Circle, and equally every Day, Divide 360 by the Number of Days in a Revolution, the Quotient will be its Mean Diurnal Motion; which you have in the Theory of every Planet.

MERIDIAN, from *Meridies, Noon*, or Mid-day, is one of the Six great Circles of the Sphere, and is exactly in the middle between Eaſt and Weſt; unto which, when the Sun or Star apparently comes, they have then the greateſt Altitude that they can have that Day. The Ball repreſenting the Earth, is divided into 24 Meridians, which by its Rotation ſhews the Moon's riſing and ſetting, *&c.*

Meridional, Southern, or towards the South. Some Ephemerediſts diſtinguiſh the South Latitude of a Planet by an M.

Motion. Sir *Iſaac Newton's* Three Laws of Motion.

1. That every Body will continue in its State, either of Reſt or Motion, uniformly forward in a Right Line, unleſs it be made to change that State by ſome Force impreſſed upon it.

2. That the Change of Motion is proportionable to the moving Force impreſs'd; and is always according to the Direction of that Right Line in which that Motion is impreſs'd.

3. That Re-action is always equal and contrary to Action; or, which is all one, the mutual Actions of Two Bodies one upon another, are equal, and directed towards contrary Parts: As, when one Body preſſes and draws another, 'tis as much preſs'd or drawn by that Body.

N.

Nadir, is an *Arabick* Word, and is that Point in the Heavens exactly under our Feet.

Nodes, are the Interſections of the Planets Orbits with the Ecliptic; as may be ſeen by the Inſtruments, where they are mark'd with ☊ and ☋, which in the Moon are call'd the Head and Tail of the Dragon.

Nonagesima Degree, is the higheſt Point of the Ecliptic at any given time of the Day or Night, in any Latitude; and is always equal to the Angle that the Ecliptic makes with the Horizon; the true Knowledge of which is of great uſe in the Calculation of Solar Eclipſes.

O.

Occidental, is when a Planet is more towards the Eaſt than the Sun; then it is ſeen in the Evening after the Sun is ſet.

Orb, of the Planets, is that imaginary Ellipſis in which they are obſerv'd to move.

Oriental, is when a Planet or Star is nearer unto the Weſt than the Sun; for then it riſes in the Morning before him.

P.

Paracentric Motion or Impetus, is a Term in the New Aſtronomy, for ſo much as the Revolving Planet approaches nearer to, or recedes further from the Sun, the Center of Attraction.

PARALLAX. The Word ſignifies a Change. In Aſtronomy it is the Difference between the true Place as obſerv'd from the Earth's Center, and the apparent Place of a Star, as ſeen from the Earth's Superficies. Of the Earth's Orb, it is the Angle made by the meeting of two Lines at the Planet coming from the Sun and Earth, and the Horizontal Parallax is greateſt.

The Parallax of the Annual Orbit is what the Earth would appear to be Elongated à ☉ to an Eye at the Planet, which in the primary Planets are theſe

	Greateſt Angle. °	′	*Leaſt Angle.* °	′
♄	6	28	5	34
♃	11	37	10	13
♂	36	22	30	34
♀	36	32	35	12
☿	25	22	16	47

That is, a Saturnian Aſtronomer would never obſerve the Earth more than 6 Degrees, 28 Minutes, nor leſs than 5 Degrees, 34 Minutes from the Sun: So that 'tis hard to ſay, whether they have diſcover'd that there is ſuch a Body as our Earth in the Univerſe. Neither has the Jovial Aſtronomer obſerv'd the ſame.

PERIGEON, is the neareſt Diſtance of a Planet or Star to the Center of the Earth. The Moon in this Poſition moves faſteſt.

PERIHELION, from *Peri*, about, and *Helios*, the Sun, the Point of the Planets Orbit, in which it is neareſt to the Sun. The Planet now moves ſwifteſt.

PHASES, Appearances of the Moon and other Planets, are thoſe enlighten'd Parts which they ſhew to us.

PHENOMENA, are the Appearances in the Heavens, or the Obſervations of what happens there, as Eclipſes, Comets, Meteors, *&c.*

PHENOMENON, is any Single Appearance in the Heavens.

PLATO'S Syſtem. He was a Divine *Athenian* Philoſopher, flouriſh'd 420 Years before Chriſt, and fix'd the Earth in the Center of the World, immovable. Next the Earth he fix'd the Air, and then the Region of Fire; above that, the Moon, and then the Sun; next, *Mercury*, then *Venus*, then *Mars*, then *Jupiter*, and laſtly *Saturn*; and above all the Planets, the Fixed ed Stars. Not much differing from this, was the Syſtem of *Porphyrius*, who flouriſh'd 325 Years after Chriſt: He differ'd from the *Platonick* Syſtem only in the Situation of *Venus* and *Mercury*, viz. he plac'd *Mercury* in an Orb above *Venus*; both of which are ridiculous and abſurd, and for that reaſon are Exploded.

PROSTAPHERESIS, is the ſame with Equation of the Planets Places.

PTOLEMY. *Claudius Ptolemæus* was a Native of *Peluſium*, a City of *Africa*, in the Kingdom of *Egypt*. He flouriſh'd 135 Years after Chriſt, and is ſaid to be Author of a Syſtem now known by that Name; in which he fixeth the Terraqueous Globe in the Center of the World, and about it the Elementary Region; next above that, the Moon; then *Mercury*; next above him *Venus*, and then the Sun moving in the middle of the Planetary Syſtem; next above him, is the Orb of *Mars*, then *Jupiter*, and then *Saturn*; and above theſe, the Fixed Stars, being made up of Solid Orbs and Epicycle, and other ridiculous ſtuff to ſolve the *Phænomena*; but Telleſcope-Obſervations have Exploded this Syſtem.

R.

RETROGRADE, the ſame with *Antecedentia*; is the going back of the Planets, according to Appearance, from *Aries* to *Piſces*, &c. But there is no ſuch real Motion in the Planets, (as may be ſeen by the Inſtrument.) Such an Appearance to us is caus'd only by the Motion of the Earth. R. in the Tables of the Theories of the Planets, ſignifies Retrograde.

RICCIOLUS. He was a Native of *Ferrara* in *Italy*, and flouriſh'd *Anno Chriſti* 1651. He could not digeſt the *Copernican* Syſtem; neither did he like the *Ptolemaick*, nor the *Tychonian*; therefore he invented a new one, being *Semi-Ptolemaick* and *Semi-Tyconick*; in which he places the Earth immovable in the Center of the Fix'd Stars, *Saturn*, *Jupiter*, the Sun and Moon; and the Sun the Center of *Mars*, *Venus* and *Mercury*. So that in this Syſtem the Orb of *Mars* cuts the Sun's twice: Therefore *Mars* in Oppoſition to the Sun, is nearer the Earth, than either the Sun or *Mercury*; and that *Venus* conjoyn'd with the Sun when ſhe is Retrograde, is nearer the Earth than *Mars* in Perigeon; and *Saturn* and *Jupiter* in Oppoſition are then in Apogeon; which is falſe, and therefore I explode this Hypotheſis. He has *Jupiter's* Four Satellites, and Two of *Saturn's*.

ROSLINUS's Syſtem, in *Jacobus Bartſchius* (Son-in-law to the Famous *Kepler*) his Book publiſh'd at *Norimberg* in the

Yea[illegible]001, has a ſtrange hodge-podge Syſtem made up of an unaccountable Quantity of Eccentric Circles: for which reaſon I ſhall neither trouble my ſelf, nor detain the Reader any longer about it; only acquaint him, that I ſaw this in the Study of my Learned and Ingenious Friend Mr. *William Beetenſon.* See the Sphere of *Marcus Manilius*, by *Sherburn*.

S.

Satellite. The Word ſignifies a Sergeant, or Yeoman of the Guard; but it is us'd for diſtinguiſhing of *Saturn*'s Five, and *Jupiter*'s Four Attendants. The Moon is a Satellite to our Earth.

Septentrional, of or belonging to the North, and the ſame with Boreal. Some Writers of Ephemeris diſtinguiſh the Latitude of the Planets by an S, which tells you, then the Planet has North Latitude.

Stationary, is when the Planets do ſeem to ſtand ſtill, and not to move at all. This always happens juſt before they become Retrograde; and alſo again before they become Direct; which is curiouſly demonſtrated by the Inſtrument.

Sun. The great Sir *Iſaac Newton* ſays in his *Principia*, that the Denſity of the Sun's Light (which is proportional to Heat) is ſeven times as great in *Mercury* as with us; and therefore our Water there would be all carry'd off, and boil away: And that the Matter of the Sun to that of *Jupiter*, is nearly as 1100 to 1; and to that of *Saturn*, as 2360 to 1. And he proves the Sun to be the common Center of Gravity of all the Planets; and that it is at reſt in the Center of the Univerſe; but by means of the Solar Spots, it hath been diſcover'd, that the Sun hath a Rotation upon its own Axis, which it performs in about 25 $\frac{1}{4}$ Days, and that the Axis of this Motion is inclin'd to the Ecliptic, in an Angle of 87 Degrees, 30 Minutes.

That the Sun's apparent Diameter being ſenſibly ſhorter in *June* than in *December*, as is plain from Obſervations, the Sun muſt be proportionably further from the Earth in Summer than in Winter; in the former of which Seaſons will be the Aphelion, and in the latter the Perihelion: For this is confirm'd by the Earth's moving ſwifter in *December* than it doth in *June*, by about $\frac{5}{60}$.

For ſince, as Sir *Iſaac Newton* has demonſtrated, by a Line drawn to the Sun, the Earth always deſcribes equal Area's in equal times, whenever it moves ſwifter, it muſt needs be near to the Sun. And for this reaſon there are about Eight Days and ſome odd Hours more from the Sun's Vernal Equinox to the Autumnal, than from the Autumnal to the Vernal Equinox. The Sun's Horizontal Parallax Dr. *Gregory* and Sir *Iſaac Newton* make but $10''$: This is what the Earth's Semidiameter would appear to be, if view'd from the Sun: And to this Solar Obſerver's Eye, the Planets would appear always Direct, and never Stationary, nor Retrograde, as they do at the Earth.

And for a Demonſtration or Reaſon why it is hotter when the Sun is more Remote from the Earth, [See Fig. 1.] which I had from my ingenious Friend Mr. *Jenkins*, who has demonſtrated why the Sun is hotter to thoſe to whom he is Vertical, than to thoſe to whom he is not.

Let A repreſent the Body of the Sun; D I C K, &c. parallel Rays of Light coming from the Sun: Let L M repreſent ſome Space on the Earth's Surface, to which Place the Sun is Vertical; the Rays will fall perpendicular, and take up the Space C K: But let the Sun be remov'd from a perpendicular Poſition, as ſuppoſe E F; here the ſame Quantity of Rays will take up the Space K B: But let the Sun be remov'd yet further from a perpendicular Poſition, as E G, there the ſame Quantity of Rays will take up the Space K M; and conſequently it muſt be colder in the laſt than in the ſecond, and in the ſecond than the firſt. 'Tis very plain. [See Mr. *Derham*'s *Aſtro-Theology*, Vol. 2. Page 93.]

System, properly, is the regular, orderly Collection, or Compoſition of many things together.

T.

Telescope, is an Optick Inſtrument which ſerves to diſcover Objects at a diſtance. And for the Night, 'tis ſufficient to uſe two Convex-Glaſſes only; but then your Object will be inverted; as, obſerving the Satellites of *Jupiter*, if a Satellite be really on the Right ſide of *Jubiter*, it will appear to you on the Left ſide, *& vice verſa.* So likewiſe looking on the Moon in the firſt Quarter, ſhe will appear to you in the Poſition of the laſt Quarter, *&c.* With a $13\frac{1}{2}$ Foot Tube and two Convex Glaſ-Glaſſes, I obſerv'd the Satellites of *Jupiter*, beginning *July* 24, 1725, and ending the Series of Obſervations on *Jan.* 19, following, *Jupiter* was all that time in *Piſces*: And I obſerv'd, that when I look'd at *Jupiter*, between the Eaſtern Horizon and the Meridian, that the Satellites lay in a Line nearly parallel to the Horizon: But when I ſaw them between the Meridian and the Weſtern Horizon, then they made an Angle with the ſaid Horizon; and the nearer they were to the Weſt, the more this Angle increaſed. Mr. *Hugens* invented a Method to uſe Glaſſes in the Night without a Tube; and this he calls an Aerial Teleſcope. Sir *Iſaac Newton* invented a Reflecting Teleſcope; and ſuch a one I have ſeen of Mr. *Gorden's* Invention, which I think, is to be preferr'd to all others. The firſt that improv'd Teleſcopes, was *Galilæus*, which ſee under that Word.

THEORY, the ſpeculative Part of any Science, without Practice.

TYCHONIAN Syſtem, takes its Name from the Inventor thereof, a *Daniſh* Lord, born at *Knudſthorp* in the Iſland *Schonen*, *Anno* 1546, and died *Anno* 1601. Firſt, The Earth is ſuppoſed fix'd, without Motion, in the Center of the Univerſe, Concentrick to which, is, the Sphere or Orb of the Moon's Motion: Next, that of the Sun's Annual Courſe; then, the Sphere of the Fix'd Stars; the Sun being plac'd as the Center of the other Planets, in whoſe Orb (as it were two Epicycles) are drawn the Orbs of *Venus* and *Mercury*; and at a great Diſtance, is that of *Mars*, interſecting the Sun's Orbit twice; and therefore being Achronical, is nearer to the Earth than the Sun. And here, by the bye, I would only ask the Maintainers of this *Hypotheſis*, What will be the conſequence of ſo near an Approach of the Sun and *Mars*, which muſt unavoidably come to paſs when they meet at the Interſections of their Orbits? Next above *Mars*, is the Sphere of *Jupiter*; and above *Jupiter*, that of *Saturn*; by which, when *Saturn* is in Oppoſition to the Sun, he is nearer the Earth than *Venus* in Apogeon; yea, as near as *Mercury* himſelf. Therefore its Supporters are oblig'd to frame Epicycles, by help of which they ſolve the *Phænomena*. It muſt alſo frequently happen in this Syſtem, that *Saturn* and *Jupiter*, conjoyn'd with the Sun in one part of their Orbits, ſhall be exceeding near the Sun; at another Conjunction they ſhall be far remov'd: And the like muſt neceſſarily happen at their Oppoſitions: But this is what hath never been obſerv'd with adjuſted Teleſcopes. I have other Reaſons to prove the Falſity of this *Hypotheſis*; but theſe are ſufficient to Explode it; and I ſhall leave the reſt to the Conſideration of the Judicious Aſtronomer.

V.

Vertex, the higheſt Point: In Aſtronomy it is the Point in the Heavens, exactly over our Heads, and is the ſame with *Zenith*, which ſee.

W. D. ſignifies Week-Days, ſhewing what Day of the Week any Day of the Month is for ever.

Y.

Year, is the time the Sun apparently takes to go through the 12 Signs of the Zodiack. This is properly the Natural or Tropical Year, and contains 365 Days, 5 h. 48 Min. 57 Sec. for during this ſpace of time all the Variety of Seaſons are celebrated. But the Sydenial Year is 365 Days, 6 H. 9 Min. 14 Sec. which is call'd the Anomaliſtical, or Periodical Year: For in that ſpace of time the Earth makes a Revolution round her Orb, and the Sun exhibits all his various Aſpects to each Fix'd Star. This ariſes from the Receſſion of the Equinoxes; which Receſſion, at 50 Seconds a Year, amounts to one Degree in 72 Years. [See the Table of the Proceſſion of the Equinox.]

Z.

Zenith, the Place in the Heavens exactly over our Heads.

Zodiack, from *Zoon*, a Living Creature; becauſe in the midle of which lyeth the Twelve Signs. It is in Breadth 18 Degrees, that is, 9 Degrees on each ſide the Ecliptick-Line, or apparent Way of the Sun.

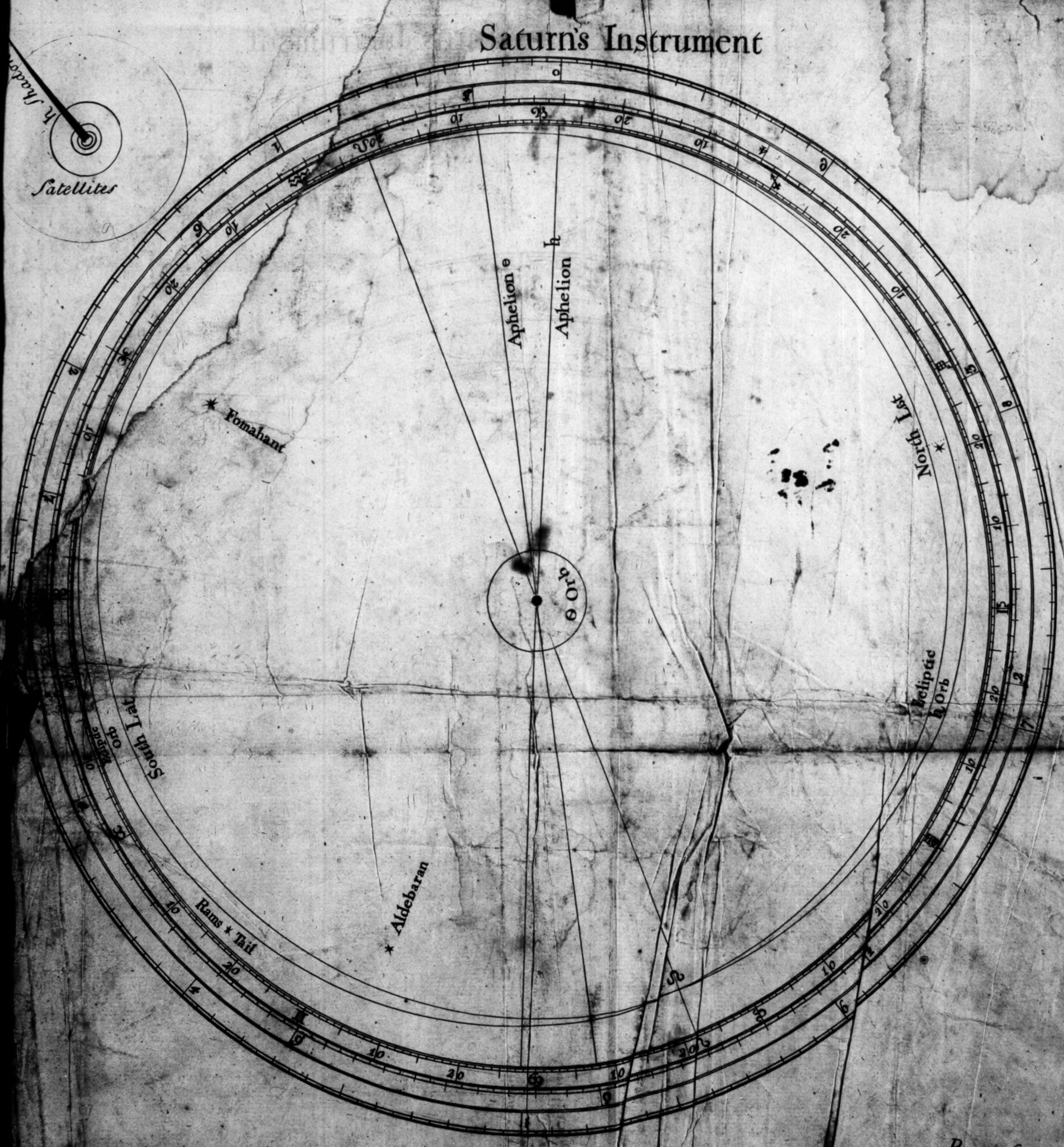
The

The Explanation of the Signs and Planets.

The SIGNS.	
Aries	♈
Taurus	♉
Gemini	♊
Cancer	♋
Leo	♌
Virgo	♍
Libra	♎
Scorpio	♏
Sagittarius	♐
Capricornus	♑
Aquarius	♒
Piſces.	♓

The PLANETS.	
Saturn	♄
Jupiter	♃
Mars	♂
Sol (the Sun)	☉
The Earth	⊖
Venus	♀
Mercury	☿
Luna (the Moon)	☽
Dragon's Head	☊
Dragon's Tail.	☋

Saturn's Instrument



A TABLE *of* 33 *Fixed Stars, Rectify'd to the Firſt Day of* January 1725, *every one of which lies in the* Moon's *Way to us at* London, *in One Revolution of her Node.*

STARS *Names.*	Long.			Latit.			Mag.
	S.	°	'	°		'	
THE middlemoſt above the South Fiſh's Tail,	♈	13	41	1	N	5	4
Former in the N. Line from the *Knot in the Nets,*	♈	23	55	1	N	38	5
Bright ✱ in the Forehead of the Whale,	♉	8	1	5	S	36	4
Firſt of the Three in the Tail of the Ram,	♉	16	58	1	N	46	4
Brighteſt of the *Pleiades,* or Seven Stars,	♉	26	8	4	N	00	3
Noſetrill of *Taurus,*	♊	1	55	5	S	46	3
North Eye of *Taurus,*	♊	4	35	2	S	36	3
South Eye of *Taurus, Aldebaran, Palilitium,*	♊	5	55	5	S	31	1
In the South Horn of *Taurus,*	♊	20	58	2	S	14	3
Propus, foremoſt in the Foot of *Gemini,*	♊	27	5	0	S	13	4
Higher Foot of *Gemini,*	♋	1	26	0	S	53	3
In the Upper Knee of the *Twins,*	♋	6	7	2	N	11	3
In the Left Knee of the *Twins,*	♋	11	12	2	S	6	3
In the Belly of the South *Twin,*	♋	14	41	0	S	13	3
North *Aſſellus,*	♌	3	40	3	N	8	4
South *Aſſellus,*	♌	4	51	0	N	4	4
In the Southern Claw of *Cancer,*	♌	9	49	5	S	8	3
The South Star in the Lyon's Neck,	♌	24	6	4	N	52	3
The Lyon's heart, *Regulus, Baſilica,*	♌	26	0	0	N	26	1
The Middle Star in the Foot of *Virgo,*	♍	17	40	0	S	33	4
In the End of the South and Left Wing of *Virgo,*	♍	23	18	0	N	43	3
Second in the Left Wing of *Virgo.*	♎	6	18	2	N	50	3
The Virgin's Spike, *Ariſta,*	♎	19	59	1	S	59	1
South Ballance,	♏	11	14	0	N	26	2
In the fore Head of *Scorpio,*	♍	29	19	1	N	5	2
The Scorpion's Heart, *Antares,*	♐	5	56	4	S	27	1
The Star following the Heart, towards the South,	♐	7	36	5	S	50	4
Southern in the North Part of the Bow of *Sagittary,*	♑	2	30	2	S	0	3
The Middle Star in the Head of *Sagittary,*	♑	11	11	0	N	59	4
South Horn of the *Goat,*	♒	0	14	4	N	41	3
Brighteſt Star in the Tail of the *Goat,*	♒	17	57	2	S	26	3
Following Star in the *Goat's* Back,	♒	19	43	2	S	29	3
Succeeding Star in the Running of the Water,	♓	7	47	0	S	19	4

A TABLE of ſeveral Fixed Stars, whoſe Places I have Rectify'd to the Beginning of the Year 1725.

STARS *Names.*	Long.			Latit.			Mag.
	S.	°	'	°		'	
THE Southern in the former Horn of ♈ called the *Firſt*,	♈	29	20	7	N	8	4
North following in the ſame Horn,	♉	0	6	8	N	29	4
Brighteſt Star in the Head of *Aries*,	♉	3	49	9	N	57	3
Southern Jaw of *Aries*,	♉	5	3	5	N	42	6
Firſt of the three in the Tail of *Aries*,	♉	16	58	1	N	46	4
End North Horn ♉, or Foot of *Auriga*,	♊	18	42	5	N	20	2
Bright Foot of *Gemini*,	♋	5	14	6	S	48	2
Head of *Hercules*, *Pollux*,	♋	15	26	6	N	38	2
Higheſt ✱ or middle and brighteſt in the Lion's Neck,	♌	25	42	8	N	47	2
Cor Caroli,	♍	22	0	40	N	30	2
The firſt of the Three in the Northern Wing of *Virgo*,	♎	1	36	13	N	36	5
The ✱ below the North Ballance to the Eaſt,	♏	17	29	8	N	7	4
In the Head of *Hercules*,	♐	12	14	37	N	23	3
In the Swan's Bill,	♑	27	27	49	N	2	3
Following Star in the left Knee, of *Capricorn*,	♒	4	11	9	S	2	6
The laſt in the Effuſion of *Aquarius*, *Fomahant*,	♒	29	55	21	S	0	1
Head of *Andromeda*,	♈	10	30	25	N	42	2
Girdle of *Andromeda*,	♈	26	32	25	N	59	2
Brighteſt ✱ in the Chair of *Caſſiopeia*,	♉	1	18	51	N	14	3
Breaſt of *Caſſiopeia*, *Scheder*,	♉	4	0	46	N	35	3
Left or South Foot of *Andromeda*,	♉	10	22	27	N	46	2
Head of *Algol*, *Meduſa*,	♉	22	20	22	N	22	1
Left Foot of *Orion*, *Rigel*,	♊	13	0	31	S	11	1
Paunch, or Belly of the *Hare*,	♊	15	49	43	S	57	3
Hircus, the He-Goat, *Capella*,	♊	17	55	22	N	50	1
Firſt Star in *Orion's* Belt,	♊	19	33	23	S	38	2
Middlemoſt Star in *Orion's* Belt,	♊	19	37	24	S	33	2
Hindermoſt Star in *Orion's* Belt,	♊	20	49	25	S	21	2
Pole-Star, Artic,	♊	24	45	66	N	2	2
Right Shoulder of *Orion*,	♊	24	55	16	S	6	2
Right Shoulder of *Auriga*, the Wain-man,	♊	27	35	21	N	27	2
Great Dog: Syrius,	♋	10	18	39	S	30	1

Fixed Stars Rectify'd to the Beginning of the Year 1725.

STARS *Names.*	Long.			Latit.			Mag.
	S.	°	′	°		′	
Higher Head of *Gemini*, *Caſtor*; *Apollo*,	♋	16	24	10	N	2	2
Leſſer Dog, *Procyon*,	♋	22	1	15	S	57	2
Shoulder of the Great Bear, 4*th* Wheel, Pointer,	♌	11	17	49	N	40	2
Flank of the Bear, 3*d* Wheel, Pointer,	♌	15	26	45	N	3	2
Heart of *Hydra*,	♌	23	28	22	S	24	1
Northern ✱ in the Lion's Neck,	♌	23	40	11	N	50	3
Left Thigh of the Bear, firſt Wheel,	♌	27	8	51	N	37	2
Brighteſt ✱ in *Leo*'s Back,	♍	7	24	14	N	20	2
Middle ✱ in the Tail of *Helice*, 2*d* Horſe, *Urſa Major*,	♍	11	39	56	N	22	2
Pole at the *Creation*, 3*d* in the Tail of the *Dragon*,	♍	3	54	66	N	36	2
Tail of *Leo*,	♍	17	46	12	N	18	1
Firſt Horſe of the Chariot of the Bear's Tail,	♍	22	55	54	N	25	2
Right Wing of *Virgo*, *Vindematrix*,	♎	6	6	16	N	15	3
Left Shoulder of *Bootes*,	♎	14	48	49	N	33	3
Arcturus, in the Conſtellation *Bootes*,	♎	20	22	31	N	2	1
Brighteſt ✱ in the Northern Crown,	♏	8	21	44	N	23	2
Brighteſt ✱ in the North Ballance,	♏	15	31	8	N	35	2
Brighteſt ✱ in the middle of the Serpent's Neck,	♏	18	13	25	N	35	2
Right Shoulder of *Hercules*,	♏	27	10	42	N	48	3
Left Shoulder of *Hercules*,	♐	10	53	47	N	47	3
Head of *Hercules*,	♐	12	14	37	N	23	3
Head of the *Dragon*,	♐	24	7	75	N	3	3
Shining Harp,	♑	11	26	61	N	47	1
Tail of the *Vulture*,	♑	15	58	36	N	16	3
Mouth of the *Swan*,	♑	27	27	49	N	2	3
North Horn of the *Goat*,	♒	0	1	1	N	2	3
Left Shoulder of *Aquarius*,	♒	19	34	8	N	42	3
Breaſt of the *Swan*,	♒	21	8	57	N	9	3
Lower Wing of the *Swan*,	♒	23	52	49	N	26	3
Mouth of *Pegaſus*,	♒	28	5	22	N	27	3
Tail of the *Swan*,	♓	1	36	59	N	56	2
Wing of *Pegaſus*,	♓	19	39	19	N	26	2
Southern ✱ in the Whale's Tail,	♓	28	39	20	N	47	2
In King *Cephas* his Girdle,	♉	1	56	71	N	7	3

The Places of Fixed Stars to the Beginning of the Year 1725.

STARS *Names.*	Long.			Latit.			Mag.
	S.	°	′	°		′	
Cephas, that in his Hood towards the North,	♈	10	42	61	N	3	4
Cynoſura, Leſſer Bear, in the Root of the Tail,	♋	5	7	73	N	50	4
Helice, the Greater Bear, that in the Snout,	♋	18	53	40	N	5	4
Draco, the Dragon, laſt in the Tail,	♌	6	21	57	N	7	3
Bootes, *Artophylax*, in the Left Hand,	♍	25	53	58	N	53	4
Corona Borealis, the North Crown, the laſt Star,	♏	14	45	48	N	24	6
Hercules, that in the Mid-Body,	♎	28	49	57	N	15	4
The *Harp*, the Northern of the two in the Yoke,	♑	17	54	56	N	6	3
Cygnus, the Swan, that in the Bill,	♑	27	27	49	N	2	3
Caſſiopeia, the Navel-Ring,	♉	8	35	47	N	31	6
Perſeus, in the Right Shoulder,	♉	26	29	34	N	30	3
Erichthonius, *Auriga*, in the Right Arm,	♊	26	11	13	N	44	4
Ophiuchus, in the Head,	♐	18	33	35	N	57	3
The Serpent of *Ophiuchus*, in the Temples,	♏	17	49	35	N	25	3
The Arrow, or Dart, the Higher and more Eaſtern,	♒	3	15	39	N	13	4
The Eagle, or flying Vulture, the * in the Head,	♒	1	12	27	N	8	6
Antinous, in the Breaſt,	♑	26	33	21	N	38	3
The Dolphin, in the Head,	♒	15	25	32	N	47	3
The Horſe-Colt, the firſt * in the Head,	♒	19	16	20	N	12	4
Pegaſus, or the Winged Horſe, the Head,	♓	2	59	16	N	25	4
Andromeda, the Head,	♈	10	30	25	N	42	2
The Triangle, in the Top of the △,	♉	3	2	16	N	49	4
Coma Berenices, in the *Cuſpis* of the firſt △,	♍	20	0	28	N	25	3
The Whale, the middle * in the Mouth,	♉	5	37	12	S	2	3
Eridanus, a River about the Foot of *Orion*,	♊	11	25	27	S	54	3
Lepus, the Hare, Laſt in the Tail,	♊	28	5	38	S	26	4
Argo, the Ship, that in Top of the Stern,	♌	7	37	43	S	18	3
Hydra, or the Water-Serpent, in the Neck,	♌	22	47	14	S	17	4
Crater, or the Water-Pot, at the Bottom,	♍	19	56	22	S	41	4
The Raven, that near the Eye, *Carvus*,	♎	7	51	19	S	39	4
Centaurus, the Southern in the Head,	♏	3	10	21	S	49	5

A TABLE, *ſhewing the Præceſſion of the Æquinox, for Years Compleat.*

Years	Præceſſ.			Years	Præceſſ.			Years	Præceſſ.			Years	Præceſſion		
	°	′	″		°	′	″		°	′	″		°	′	″
1	0	0	50	31	0	25	50	61	0	50	50	100	1	23	20
2	0	1	40	32	0	26	40	62	0	51	40	110	1	31	40
3	0	2	30	33	0	27	30	63	0	52	30	120	1	40	0
4	0	3	20	34	0	28	20	64	0	53	20	130	1	48	20
5	0	4	10	35	0	29	10	65	0	54	10	140	1	56	40
6	0	5	0	36	0	30	0	66	0	55	0	150	2	5	0
7	0	5	50	37	0	30	50	67	0	55	50	160	2	13	20
8	0	6	40	38	0	31	40	68	0	56	40	170	2	21	40
9	0	7	30	39	0	32	30	69	0	57	30	180	2	30	0
10	0	8	20	40	0	33	20	70	0	58	20	190	2	38	20
11	0	9	10	41	0	34	10	71	1	59	10	200	2	46	50
12	0	10	0	42	0	35	0	72	1	00	0	300	4	10	0
13	0	10	50	43	0	35	50	73	1	0	50	400	5	33	20
14	0	11	40	44	0	36	40	74	1	1	40	500	6	56	40
15	0	12	30	45	0	37	30	75	1	2	30	600	8	20	0
16	0	13	20	46	0	38	20	76	1	3	20	700	9	43	20
17	0	14	10	47	0	39	10	77	1	4	10	800	11	6	40
18	0	15	0	48	0	40	0	78	1	5	0	900	12	30	0
19	0	15	50	49	0	40	50	79	1	5	50	1000	13	53	20
20	0	16	40	50	0	41	40	80	1	6	40	2000	27	46	40
21	0	17	30	51	0	42	30	81	1	7	30	3000	41	40	0
22	0	18	20	52	0	43	20	82	1	8	20	4000	53	33	20
23	0	19	10	53	0	44	10	83	1	9	10	5000	69	26	40
24	0	20	0	54	0	45	0	84	1	10	0	6000	83	20	0
25	0	20	50	55	0	45	50	85	1	10	50	7000	97	13	20
26	0	21	40	56	0	46	40	86	1	11	40	8000	111	6	40
27	0	22	30	57	0	47	30	87	1	12	30	9000	125	0	0
28	0	23	20	58	0	48	20	88	1	13	20	10000	138	53	20
29	0	24	10	59	0	49	10	89	1	14	10	20000	227	46	40
30	0	25	0	60	0	50	0	90	1	15	0	25920	360	00	00

This Table is to be us'd in Rectifying the Fix'd Stars Places; in which is ſhew'd, that they make, or compleat one Revolution in 25920 Years; for time to come, from 1725, add the Præceſſion to the Longitude of the Star, gives the Place requir'd.

An Alphabetical TABLE of the Latitudes of ſome of the moſt Eminent Cities and Towns in the World; with their Longitude, from London.

PLACES Names.	Latit. °	′	Longit. °	′
Aberdeen, in *Scotland*,	57 N	6	1 W	43
Adrianople, in *Aſia Minor*,	38	0	31 E	0
Agra, in *India*, the *Mogul's* Court,	28	30	78	50
Agria, in *Hungary*,	48	30	19	30
Aleppo, in *Turkey*, in *Aſia*,	35	30	38	00
Alexandria, in *Egypt*,	30	30	31	30
Amſterdam, in *Holland*,	52	25	5	15
Antioch, in *Syria*,	35	8	38	00
Antwerp, in *Flanders*,	51	20	4	00
Aracta, in *Syria*,	36	00	41	15
Arda, in *Guinea*,	9	18	2	49
Arras, in the Low Countries, on the River *Scharp*,	50	18	2	49
Arles, in *France*, on the River *Rhône*,	43	40	4	46
St. Aſaph, in *Flintſhire*, *Wales*,	53	18	3 W	35
Aſſumption, in *Paragu*, on the River *Rio de la Plata*,	25 S	20	54	20
Athens, in *Greece*,	37 N	25	40 E	30
Avignon, in *France*, on the River *Rhône*,	43	57	4	51
Babylon, in *Turkey*, in *Aſia*,	34	30	48	30
Bangor, in *Carnarvanſhire*, in *Wales*,	53	21	4 W	18
Barcino, or *Barcelona*, in *Spain*, on the Mediterranean,	49	34	2 E	00
Barwick upon *Tweed*, in *England*,	55	49	1 W	31
Baſil, in *Swiſſerland*,	47	10	7 E	40
Bath, in *Somerſetſhire*, in *England*,	51	21	2 W	32
Bedford, in *England*,	52	8	0	30
Bergen, in *Norway*,	60	00	5 E	30
Berlin, in *Germany*,	52	33	13	30
Bermudas-Iſland, Middle,	32	25	63 W	30
Bethlehem, in *Judæa*,	31	49	35 E	0
Beumoris, in the Iſle of *Angleſey*, in *Wales*,	53	20	4 W	11
Boſton, in *New England*,	42	00	71	15
Bourdeaux, in *France*,	44	46	0	20
Brecknock, in *Brecknock-ſhire*, in *Wales*,	52	00	3	20
Briſtol, in *Somerſetſhire*, in *England*,	51	28	2	47
Brunſwick, in *Germany*,	52	26	10 E	50
Buckingham, in *Buckinghamſhire*, in *England*,	51	58	1	00
Cambridge, in *Cambridgſhire*, in *England*,	52	17	0	5

The TABLE *Continu'd.*

PLACES Names.	Latit. °	′	Long. °	′
Canterbury, in *Kent*, in *England*,	51	N 18	1	E 15
Cardiff, in *Glamorganſhire*, in *Wales*,	51	31	3	W 14
Cardigan, in *Cardiganſhire*, in *Wales*,	52	7	4	40
Carliſle, in *Cumberland*, in *England*,	54	56	2	46
Carmarthen, in *Carmarthenſhire*, in *Wales*,	51	53	4	24
Carnarvan, in *Carnarvanſhire*, in *Wales*,	53	10	4	21
Cheſter, in *Cheſhire*, in *England*,	53	10	3	W 4
Chicheſter, in *Suſſex*, in *England*,	50	53	0	55
Colcheſter, in *Eſſex*, in *England*,	51	55	1	E 0
Conſtantinople, the Seat of the Grand Seignior,	41	7	31	E 45
Copenhagen, in *Denmark*,	55	40	12	E 0
Coventry, in *Warwickſhire*, in *England*,	52	26	1	W 30
Cracow, in *Poland*,	50	10	19	E 35
Cronton, in *Lancaſhire*, in *England*,	53	22	2	W 48
Dantzick, in *Pruſſia*,	54	13	19	E 0
St. David's, in *Pembrokeſhire*, in *Wales*,	52	1	5	W 31
Denbigh, in *Denbighſhire*, in *Wales*,	53	10	3	25
Derby, in *England*,	52	55	1	36
Dorcheſter, in *Dorſetſhire*, in *England*,	50	41	2	37
Dover, in *Kent*, in *England*,	51	10	1	E 30
Douglas, in the Iſle of Man,	54	4	4	W 23
Dublin, in *Ireland*,	53	12	7	3
Durham (Biſhoprick) in *England*,	54	48	1	23
Edinburgh, in *Scotland*,	55	57	3	0
Ely, in *Cambridgeſhire*, in *England*,	52	24	0	E 13
Epheſus, in *Aſia Minor*,	38	30	28	0
Exeter, in *Devonſhire*, in *England*,	50	44	3	W 36
Faro-Head, North Part of *Scotland*,	59	20	5	8
Flint, in *Flintſhire*, in *Wales*,	53	13	3	10
Florence, in *Italy*,	43	40	12	E 15
Fort St. George, alias *Madras*, in the Eaſt Indies,	13	8	81	1
Gibralter, in *Spain*,	36	30	6	W 8
Glaſcow, in *Scotland*,	55	50	4	10
Glouceſter, in *Glouceſterſhire*, in *England*,	51	53	2	15
Guilford, in *Surry*, in *England*,	51	13	0	36
Hague, in *Holland*,	52	20	4	E 0

The TABLE Continu'd.

PLACES Names.	Latit.		Longit.		
	°	'	°		'
Hamburgh, in *Denmark*,	53	57	10	E	10
Hanover, in *Germany*,	52	30	9		54
Hartford, in *Hartfordſhire*, in *England*,	51	47	0	W	5
Hereford, in *Herefordſhire*, in *England*,	52	4	2		50
Herleigh, in *Merionethſhire*, in *Wales*,	52	55	4		10
Huntington, in *Huntingtonſhire*, in *England*,	52	17	0		15
James-Town, in *Virginia*,	36	30	77	W	30
Jeruſalem, in *Aſia Minor*,	32	0	35	E	30
Inſpruck, in *Germany*,	47	15	11		50
Ipſwich, in *Suffolk*, in *England*,	52	8	1		12
Kalmar, in *Denmark*,	56	40	16		40
Kebeck, or *Quebeck*, in *Canada* in *North America*,	46	55	69	W	48
Kendal, in *Weſtmorland*, in *England*,	54	15	2	W	32
Lancaſter, in *Lancaſhire*, in *England*,	54	5	2		50
Lanceſton, in *Cornwall*, in *England*,	50	42	4		35
Landaff, in *Glamorganſhire*, in *Wales*,	51	33	0		22
Leghorn, in *Italy*,	42	52	11	E	0
Leiceſter, in *Leiceſterſhire*, in *England*,	52	37	1	W	7
Leverpool, in *England*,	53	22	2		55
Leyden, in *Holland*,	52	13	4	E	0
Lincoln, in *Lincolnſhire*, in *England*,	53	15	0	W	33
Lisbon, in *Portugal*,	38	50	10		25
Litchfield, in *Staffordſhire*, in *England*,	52	41	1		48
Lizard-Point, South Part of *England*,	50	0	5		14
LONDON, the Grand Meridian,	51	32	0		0
Londonderry, in *Ireland*,	54	55	8		0
Madrid, in *Spain*,	40	10	3		10
Mancheſter, in *Lancaſhire*, in *England*,	53	22	2		13
Marſeilles, in *France*,	43	20	5	E	27
Meccha, the Birth-Place of the Impoſtor *Mahomet*,	21	30	40		30
Medina, in *Arabia Felix*, where *Mahomet* was bury'd,	24	15	39		50
Mexico, in *New Spain*, in *America*,	19	0	101	W	15
Mocha, in *Arabia*, by the Red Sea,	13	28	42	E	0
Monmouth, in *Monmouthſhire*, in *Wales*,	51	50	2	W	44
Montgomery, in *Montgomeryſhire*, in *Wales*,	52	33	3	W	7
Moſcow, in *Moſcovia*, in *Ruſſia*,	55	30	39	E	30
Naples, in *Italy*,	41	8	14		50
Newcaſtle Under-Line, in *Staffordſhire*,	53	0	2	W	12

New-

The TABLE *Continu'd.*

PLACES Names.	Latit.			Longit.		
	°		′	°		′
Newcaſtle upon *Tine*, in *Northumberland*, in *England*,	54	N	57	1	W	22
Northampton, in *Northamptonſhire*, in *England*,	52		17	0		55
Norwich, in *Norfolk*, in *England*,	52		43	1	E	20
Nottingham, in *Nottinghamſhire*, in *England*,	52		58	1	W	6
Okeham, in *Rutlandſhire*, in *England*,	52		37	0		44
Oxford, in *Oxfordſhire*, in *England*,	51		45	1		15
Padua, in *Italy*,	45		30	12	E	0
Paris, in *France*,	48		45	2		24
Pecks-Hill, in *Lancaſhire*, in *England*,	53		22	2	W	47
Pembroke, in *Pembrokeſhire*, in *Wales*,	51		42	4	W	56
Peterborough, in *Northamptonſhire*, in *England*,	52		33	0		20
Petersburgh, in the Gulf of *Finland*,	60		4	39	E	0
Philadelphia, in *Penſilvania*, in *America*,	39		0	78	W	0
Plimouth, in *Devonſhire*, in *England*,	50		24	4		25
Port-Maon, in *Minorca*,	39		45	4	E	0
Port-Royal, in *Jamaica*,	17		40	76	W	0
Portſmouth, in *Hampſhire*, in *England*,	50		47	1		12
Quaqua, on the Coaſt of *Guinea*,	4		6	4		4
Radnor, in *Radnorſhire*, in *Wales*,	52		18	3		6
Reading, in *Berkſhire*, in *England*,	51		24	1		3
Revel, in the Gulf of *Finland*,	59		13	24	E	0
Richmond, in *York ſhire*, in *England*,	54		25	1	W	37
Rocheſter, in *Kent*, in *England*,	51		25	0	E	41
Rome, in *Italy*,	41		50	12		30
Roterdam, in *Holland*,	52		8	4		0
Red Sea, Middle,	20		0	39		0
Salisbury, in *Wiltſhire*, in *England*,	51		4	1	W	36
Scanderoon, in *Aſia Minor*,	36		30	36	E	50
Sevile, in *Spain*,	37		34	5	W	20
Shrewsbury, in *Shropſhire*, in *England*,	52		43	2		40
Sodor, in the *Iſle of Man*,	53		56	4		35
Southampton, in *Hampſhire*, in *England*,	50		55	1		33
Stafford, in *Staffordſhire*, in *England*,	52		47	2		10
Stockholm, in *Sweden*,	59		30	17	E	30
Suratt, in Higher *India*,	21		30	71		54
Tameſwaer, in *Hungary*,	47		30	20		9
Tangier, at the Streights Mouth, in *Africa*,	35		55	6	W	12

The TABLE *Continu'd.*

PLACES Names.	Latit.		Longit.		
	°	′	°		′
Toledo, in *Spain*,	39	54	3	W	40
Trent, in *Germany*,	47	20	13	E	30
Turin, in *Italy*,	44	50	7		15
Valencia, in *Spain*,	39	45	0	W	20
Venice, in *Italy*,	45	36	13	E	0
Vienna, in *Germany*,	48	30	15		15
Ulliſpo, in *Portugal*,	38	45	8	W	45
Uraniberg, in the Iſland *Ween*,	55	54½	13	E	0
Ulrich, in *Holland*,	52	14	4		30
Warrington, in *Lancaſhire*, in *England*,	55	22	2	W	43
Warſaw, the Seat of the King of *Poland*,	52	14	21	E	48
Warwick, in *Warwickſhire*, in *England*,	52	18	1	W	35
Wells, in *Somerſetſhire*, in *England*,	51	11	2		49
Wiggan, in *Lancaſhire*, in *England*,	53	34	2		45
Wincheſter, in *Hampſhire*, in *England*,	51	3	1		20
Wittenburgh, in *Germany*,	51	54	14	E	26
Wymour, in *Germany*,	51	4	12		46
Wolverhampton, in *Staffordſhire*, in *England*,	52	38	2	W	14
Woodſtock, in *Oxfordſhire*, in *England*,	51	53	1		23
Worceſter, in *Worceſterſhire*, in *England*,	52	14	2		14
Yarmouth, in *Norfolk*, in *England*,	52	46	1	E	40
Yarmouth, in the Iſle of *Wight*,	50	41	1	W	40
York, in *Yorkſhire*, in *England*,	53	55	0		57
Zamora, in *Spain*,	41	45	4		48

* * *

To find the Declination of the Fixed Stars.

EXAMPLE.

LET it be requir'd to find the Declination of the brighteſt of the *Pleiades*, having given

The { Longitude in ♉ 26° 8′
Latitude 4 0 N.

In this *Diagram*, *Fig.* 13. let the Circle repreſent the Solſtitial Colure. Take the Half *t.* of 56° 8′, the Star's Diſtance from ♈; and ſet it from ♈, to *e* on the Ecliptick; and draw the great Circle P *e s*; from *e* to *f* ſet off the Lat. 4° N. and draw the Circle of Longitude *c f d*, *c* and *d* being the Poles of the Ecliptick: Now is there form'd the Oblique Angle Spherick △ *f* P *c*, in which is given, (1.) P *c* 23° 30′, the Diſtance of the two Poles; (2.) *f c* 86°, the Star's Diſtance in the Circle of Longitude from the Pole of the Ecliptick = to the Complement of its Latitude. (3.) The Angle P *c f*, the Star's Longitude from ♋, or the Solſtitial Colure; to find *f* P the Complement of the Declination. From P, let fall the Perpendicular P *b*, to paſs thro' the Pole of the Oblique Circle *d f c* at G. Firſt, for the Segment *b c*.

	°	′				°	′
As *c t* of P *c*	23	30	10.361698	from	♋	90	0
To Radius	90	00	10.000000	Sub.	♉	26	8
So *c s* Ang. *b c* P	33	52	9.919254	Reſt Ang. *c*		33	52
To *t. b c*	19	51	9.557556				
f c =	86	00					
Reſt *f b* =	66	9					

Secondly, By the Homogeneal Parts ſay,

As *c s*, *b c*	19	51	Co. Ar. 0.026602	By which I have found the Declinat. to be 23° 16′ N.
To *c s*, *f b*	66	9	9.606750	
So *c s*, *c* P	23	30	9.963298	
To *c s*, *f* P = *s f b*	23	16	9.596550	

Example 2. Let it be requir'd to find the Declination, or the Diſtance of the Fixed Star in the Tail of *Draco*, from the Pole of the Equinoctial, this Year 1725: Having given

The { Long. ♍ 3° 54′
Lat. N. 66 36,

I ſhall work this by Tranſpoſition; where obſerve, that becauſe the Star has North Latitude, and in a Northern Sign, that you ſubt. the firſt Angle from the Complement of the Star's Latitude; the Remainder is the ſecond Angle.

	°	′		°	′	
As Radius	90	00	10.000000	90	0	
To *s* the Star's diſt. à ♎	26	6	9.643393	66	36	Lat.
So *t.* of the Obliquity	23	30	9.638302	23	24	Comp.
To the *t.* of the Angle	10	50	9.281695			
Complem. Star's Lat.	23	24				
Rem. the *2d* Angle	12	34				
As *c s* of the firſt Angle	10	50	Co. Ar. 0.007809			
To *c s* of the ſecond	12	34	9.989469			
So *c s* Obliquity	23	30	9.962398			
To *c s* of diſt. à Pole Art.	24	20	9.989676			*Anno* 1725.
Complem. is Declination	65	40	North.			

For the Right Aſcenſion of this Star.

As *c s* of Declin. Co. Ar.	65	40	0.385056
To *c s* Long à ♎	26	6	9.953290
So *c s* Lat.	66	36	9.598952
To *c s* diſt. à ♎	30	4	9.937298
	180	0	
Rem. R. A. from ♈	149	56	

Secondly, For the R. A. of the Seven Stars ſay,

As *c s* Declin. Co. Ar.	23	16	0.036898
To *c s* Long. from ♈	56	8	9 746059
So *c s* Lat	4	0	9.998941
To *c s* R. A. from ♈	52	46	9.781896

Note, At the Creation of the World, that Star of the ſecond Magnitude which was the Polar Star then, was the Third in the Tail of *Draco* above-mention'd ; whoſe Place and Diſtance from the Pole I would then know. But firſt, we muſt enquire what Year of the World the Year of Chriſt 1725, was. And becauſe *Julius Scaliger* fix'd the Beginning of the *Julian* Period 764 Years before the Creation,

			°	′	″
From the *Julian* Period at the Birth of Chriſt	4713	5000	69	26	40
Subtract	764	600	8	20	0
		74	1	1	40
Chriſt born *Anno Mundi*	3949				
Add the Year of Chriſt	1725				

			S.	°	′	″
Year of the World anſwering	5674	Præ.Equ.	2	18	48	20
Place of the 3*d* ✱ in Tail of *Draco* 1725			5	5	53	50
Rem. Place of the ✱ at the Creation			2	15	5	30
And its Diſtance from the Pole was then				5	57	00

OPERATION.

Tycho's Catalogue 1601, in *Wing's Harmonicon*, makes the Third Star in the Tail of *Draco*

	S.	°	′	″
Anno 1601,	5	2	10	30
From 1725 Years.				
Rem. 124 Motion in that time is, add		1	43	20
Anno 1725, its Place is	5	3	53	50
5674 Years Motion ſub.	2	18	48	20
Star's Place at the Creation	2	15	05	30
And Lat. North	0	66	36	00

	°	′	
As Radius	90	0	10.100000
To S. Star's Long. from ♈	75	5½	9.985129
So *t.* Obliquity Ecliptick	23	30	9.638302
To *t.* of the Ark	22	47	9.623431
Complement Lat.	23	24	
Rem. the ſecond Angle	0	37	
As *c s*, of the firſt Ang. Co. Ar.	22	47	0035281
To *c s* ſecond Angle	0	37	9.999975
So *c s* Obliquity	23	30	9.962398
To *c s*, Star's Diſt. à N. Pole	5	57	9.997654

Dr *Hook* was the firſt (that I know of) who made an Attempt towards diſcovering the Annual Parallax of the Fixed Stars (for Diurnal they have none ;) which he did in the Months of *July*, *Auguſt* and *October*, by obſerving of the bright Star in the Head of the *Dragon* ; whoſe Diſtance from the Zenith he always found diminiſhing ; and then again, he found the Star declin'd a little from the Zenith towards the North, and in a Year's time found it to be 26″, which he calls the Annual Parallax.

The Learned Mr. *Flamſteed* did for ſeven Years ſucceſſively obſerve the Annual Parallax of the Fixed Stars, and at laſt determin'd that of the Polar Star to be 42″, and of *Syrius* 30″, and the greateſt Parallax of the Annual Orbit to be 47″; which is an evident Proof of the Earth's Motion. [See *Gregory*'s *Aſtronomy*, P. 499.]

From hence we may eaſily gather, how long it will be before any Fixed Star comes to any particular Place in the Zodiack, in reſpect of Longitude : For their Latitudes they never alter ; becauſe they move upon the Poles of the Ecliptick (except Four) as the Learned Dr. *Halley* tells us in Philoſoph. Tranſact. N°. 355, that ſince *Ptolemy*'s time, *Palilitium*, or the Bull's South Eye is 20′ more South of the Ecliptick now, than he was then ; and *Syrius* 22′, *Arcturus* 33′, and that the bright Shoulder of *Orion* is almoſt 1° more North now, than he was in *Ptolemy*'s time.

By the following *Synopſis* you may come to know when the Declinations of the Fixed Stars increaſe, and when they decreaſe: For if the Longitude of the Star be from the Beginning of *Capricorn*, to the Beginning of *Cancer*,

Then { North Declination increaſes,
South Declination decreaſes, } till it come to the Equinoctial, and then it increaſes.

But between ♋ and ♑ { North Declinat. decreaſes,
South Declinat. increaſes.

As for Inſtance; the North Pole Star's Declination will increaſe, until the Star in Longitude come to *Cancer*, and then it will be 89° 32′ N. For it will never come nearer the ſaid Pole than 28′, and then by the Receſſion of the Equinox, the Star will ſeem to move thro' *Cancer*, *Leo*, *Virgo*, *Libra*, *Scorpio*, and *Sagittary*; and all this time its Declination decreaſes until its Longitude be in *Capricorn*, and that will be about the Year of Chriſt 15063, when the North Pole Star that is now, will then be in the Place where the Right Wing of the Kite above *Lyra* is now, diſtant only 9 Degrees from our Zenith to the Southward, and Declination North 42 Degrees 32 Minutes:

	°	′
For from its Declination when in *Cancer*	89	32
Sub. Diſtance of the two Tropicks,	47	0
Reſt Declination North when in *Capricorn*, Sub.	42	32
From Latitude of *London*	51	32
Rem. Pole's Diſtance from the Zenith	9	0

to the South: And from *Capricorn* its Declination will again increaſe; and ſo of all the reſt of the Stars.

Becauſe this Work may fall into the hands of ſome that are unacquainted with Spherick Trigonometry, and the Doctrine of the Sphere; therefore I ſhall give them theſe perpetual Rules to be obſerv'd in finding the Declinations and R. Aſcenſions of the Planets and Fixed Stars, with Latitude.

If

If the Declination ſought be in the	Northern Signs and	North Latitude, ſubtract the firſt Arch found from the Complement of the Star's Latitude, the Remainder is the ſecond Arch.
		South Latitude, add the Arch firſt found to the Complement of the Star's Latitude; that Sum is the ſecond Arch.
	Southern Signs and	North Latitude, add the firſt Arch found to the Complement of the Star's Latitude, and the Sum is the ſecond Arch.
		South Latitude, ſubtract the firſt Arch from the Complement of the Star's Latitude; and there remains the ſecond Arch.

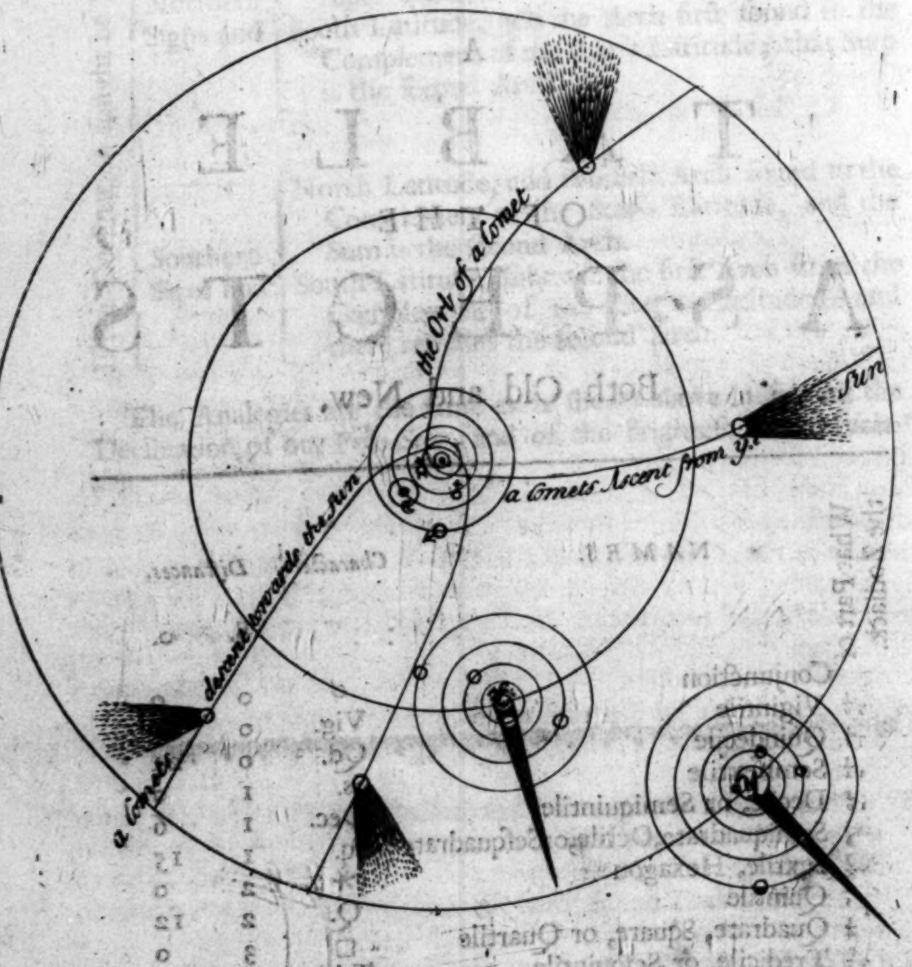
The Analogies are the ſame as is ſhewn above in finding the Declination of our Pole-Star, and of the brighteſt of the *Pleiados.*

FINIS.

A TABLE OF THE ASPECTS

Both Old and New.

What Part of the Zodiack.	*NAMES.*	*Characters.*	*Diſtances.* S.	o.
	Conjunction	☌	0	0
1/20	Vigintile	Vig.	0	18
1/15	Quindecile	Qd.	0	24
1/12	Semiſextile	Ss.	1	0
1/10	Decile, or Semiquintile	Dec.	1	6
1/8	Semiquadrate, Octile, or Seſquadrate	Sq.	1	15
1/6	Sextile, Hexagon	✱	2	0
1/5	Quintile	Q.	2	12
1/4	Quadrate, Square, or Quartile	□	3	0
3/10	Tredicile, or Seſquintile	Td.	3	18
1/3	Trine	△	4	0
3/8	Seſquiquadrate.	Sſq.	4	15
2/5	Biquintile.	Bq.	4	24
5/12	Quincunx	Vc.	5	0
1/2	Oppoſition	☍	6	0


the Orb of a Comet
a Comets Ascent from ye Sun
a Comets descent towards the Sun

A Description of the *COPERNICAN* Or True SYSTEM of the World.

THIS Syſtem was firſt invented by *Pythagoras* the *Samian*, who flouriſh'd 509 Years before the Birth of Chriſt; but after his time it lay dormant till *Nicholas Copernicus* reviv'd it; and now has gain'd the Eſteem of all the Learned World.

It is made up of 17 Bodies: Firſt, in the Center of the Univerſe is fix'd the Sun, with a Rotation only upon its own Axis, in 25 ¼ Days, who is the Center, or Fountain of Light, Heat and Gravity: Next to the Sun is *Mercury*; then *Venus*; next above *Venus* is the Earth's Orb, in which ſhe maketh her Annual and Diurnal Motions; about our Earth is the Moon, moving always direct in her Menſtrual Revolution, having a Rotation upon her own Axis exactly in the ſame time. Next above our Earth, is the Orbit of *Mars*; then *Jupiter* with his Four Attendants: Next above him, is *Saturn*, with his Five Moons, who is the higheſt Planet in our Syſtem: And far without theſe Orbits, at a vaſt Diſtance, is the Sphere of the Fix'd Stars; being diſtant at ſo great an Interval from the Sphere of *Saturn*, that the Annual Orb in which the Earth moves, appears, in reſpect to it, no other than a Point.

The Orbits are diſtant from the Sun nearly thus, *viz.*

♄	953800	Parts.
♃	520110	
♂	152369	
⊖	100000	
♀	72333	
☿	38710	

By which, and the Line of Lines on the Sector, the Syſtem is laid down. [See the adjacent Diagram.]

* * *

Firſt, My Numbers I have adapted to the Uſe of theſe my Inſtruments only, and ſo to the laſt Day of the *Julian* Year at Noon, under the Meridian of *London*; by help of which, with a very little trouble, you have the Anomalies, the Latitudes of the Planets, as ſeen from the Sun, and alſo the Days of the Week; which Method is perfectly new, very correct, and of great uſe to Mankind.

2dly, The Inſtruments conſiſt of Three Concentrick, and Three Eccentrick Circles, Two Indexes and Two Threads. In the outmoſt Circle is the Planets co-equated Anomaly; the grand Diviſions are 1000, and are number'd with 1, 2, 3, &c. to 10, which ſtands for 10000; the next Diviſions are 100, and the ſmall Diviſions are 50, as is more fully ſhew'd in the Table of Inclinations, which exactly anſwers to the Diviſions of the Planets Anomalies in the Inſtrument. The next Circle is the Earth's Anomaly (in all the Planets) divided and number'd as above. The next Circle within that, is the 12 Signs of the Zodiack, every Diviſion of which is One Degree, in the ſuperiour Planets *Saturn*, *Jupiter* and *Mars*. The next Circle within is the Planets Orb and Ecliptick, making an Angle equal to their Heliocentrick Latitude. Within theſe, is the Earth's Orbit; but in the Inferiours *Venus* and *Mercury*, the Earth's Orb is placed next unto the Sun, who is fixed on the Center, making a Rotation in 25 ¼ Days.

* next to the Zodiack, and theirs within

On the Center ⊙ there move Two Indexes, as mark'd A; *Saturn's* Index, in which there is a Slit and movable Nut, to anſwer his Eccentricity; and B the Earth's Index, with the Thread c ⊕, and the Thread d ⊕ parallel to it gives ♄'s Geocentrick Place. [See ♄'s Inſtrument.]

Theſe large Schemes, which I call the *Planets Inſtruments*, muſt be taken out of the Book, and paſted upon a Board truly plain'd for that purpoſe, and Braſs *Indexes* fitted according to the Schemes.

The Theory of SATURN.

SATURN is the higheſt Planet in our Syſtem, and is always obſerv'd with a round full Face: He is of a heavy dull Lead-Colour, and is liable to be hid from our Sight by all the Planets, when in Conjunction with him, if then their Latitudes do agree. He makes one Revolution in 29 Years, 174 Days, 6 H. 36 Min. 26 Sec. He is direct, ſtationary and retrograde to us at the Earth, and makes all the Aſpects with the Sun; He moves in a Day 2 Min. 1 Sec. and every 378 Days is conjoyn'd with the Sun; and then, if near his Aphelion, is diſtant from the Earth 152454 Semidiameters of the Earth; which multiply'd by 3989.58, will give 608227429.32, his Diſtance in *Engliſh* Miles. He is attended with Five Satellites, which I have drawn upon one Corner of his Inſtrument. They make their Revolutions in the Times as below.

	D.	H.	′	″
The Firſt, and next unto him, in	1	21	18	26 ½
The Second, in	2	17	41	10 ½
The Third, in	4	12	25	10
The Fourth, in	15	22	41	28
The Outmoſt, in	79	7	46	0

Theſe Times, are according to the Reverend Mr. *James Pound*, which he gives us in Philoſophical Tranſactions, N°. 356; where there are alſo Tables of all their Motions, which were firſt Publiſh'd by Monſieur *Caſſini*, in the Year 1686. But they can only be ſeen with a very large Tube, as that Gentleman gives us an Account in N°. 355. of the Philoſophical Tranſactions, where the Rectification of their Motions are inſerted.

		°	′	″
Anno 1725, *Saturn's* Aphelion	♐	27	47	0
Aſcending Node	♋	21	45	12
The Annual Motion of the Node				36
Inclination of the Orbit		2	30	30
Greateſt Diſtance from the Sun				1008342
Mean Diſtance				953800
Leaſt Diſtance				898956
Eccentricity				54700
	D.	H.	′	″
He turns once round upon his Axis in	29	10	1	16

He is greater than our Earth 298 times, and his Semidiameter is 4855; of ſuch Parts as the Earth's Semidiameter is, 727; but his Apparent Semidiameter, 10″ 30‴.

This Planet has a Ring, or Belt ſurrounding him, like the Horizon of an Artificial Globe, entirely encompaſſing round the Planet, and no where touching it. Its Plane is at this time nearly Parallel to our Earth's Equator. The Diameter of this Ring is 2 ¼ of *Saturn's* Diameter; and the Diſtance of the Ring from the Planet is about the Breadth of the Ring it ſelf. Mr. *Hugens* and Mr. *Picart* inferr'd the Angle of the Plane of the Ring with that of the Ecliptick, to be about 31°; and this Ring Aſtronomers call the *Anſæ* of *Saturn*, becauſe it appears on each ſide of him like Handles.

Saturn is ſo far remov'd from us, that his Spots are not to be diſcern'd; yet 'tis probable that he, as well as the other Planets, has a Rotation round his Axis, as above.

The Immerſions of his Satellites can only be ſeen when he is Oriental of the Sun, that is, from the Oppoſition to Conjunction with the Sun; and their Emerſions when he is Occidental, or from the Conjunction to Oppoſition.

These are the general Phænomena of *Saturn.*

To find the Place of Saturn *by the Inſtrument.*

1. TO the Year, Month, Day and Hour propoſed, write out of theſe Tables the Numbers anſwering to the Earth and *Saturn* ſeverally; (but in Leap-Year mind to take the Motion of a Day more) and collect them into one Sum; and if the Anomaly amount to Radius 10000, and Week-Day to 7, reject them; ſo have you the Day of the Week, with the Anomaly of the Earth and *Saturn* for the time propoſed: Which Anomalies ſeek in the Inſtrument in their proper Circles, and to them lay their reſpective Indexes: Then take the Thread that comes from *Saturn*, and lay it to cut the Earth's Index, where the Index cuts the Earth's Orb: Here hold it, and lay the Thread that comes from the Center parallel thereto: Then does this Central Thread cut the innermoſt divided Circle in Signs, Degrees and Minutes of his Place in Longitude.

2. The Latitude of the Planet is alſo ſeen at the ſame time, whether North or South: But if you would have it to a Minute, enter the Table of Inclinations with the Planet's Anomaly, and there you have the Inclination anſwering: Then if the Planet be neither in Conjunction, nor Oppoſition with the Sun, it will always hold,

As the Sine of the Commutation, or Angle at the Sun,
To Sine of Elongation, or Angle at the Earth;
So Tang. of the Inclination, or Latitude at the Sun,
To Tang. of the Latitude ſeen from the Earth.

Here you are to obſerve, that the Latitude, as it is really the Planet's Diſtance in its Orb from the Ecliptick, and as it is ſeen from the Earth, is very different: For as in the firſt Caſe, it is really ſo; but in the latter it is only the Angle that it is beheld under at the Earth, and depends always upon the Diſtance and Poſition of the Earth. This I have demonſtrated upon *Mars's* Inſtrument, which is the ſame with the annex'd Diagram. [See Fig. 2.] In which, the Out-Circle repreſents the Orb of *Mars*, cutting the Ecliptick in two oppoſite Points at ☊ and ☋, call'd Nodes; the other, that of the Earth; A, the Place of the Earth, from which *Mars* is ſeen in Conjunction with the Sun; B, her Place when in another Poſition; ♂, the Place of *Mars*; and in both Poſitions of the Earth *Mars* is equally diſtant from the Nodes, and conſequently muſt have the ſame Inclination, or Heliocentrick Latitude = C ♂: But the Latitude ſeen from the Earth in B, will be the Angle C B ♂; but the Earth in A, the Geocentrick Latitude of *Mars*, will then be leſs than the Heliocentrick ♂, *viz.* the Angle C A ♂.

When the Planet is in exact Conjunction, or Oppoſition to the Sun, then the Triangle that forms the Demonſtration of the Calculus alſo vaniſhes; and therefore the former Analogy in this Caſe will not do: But then ſay,

As the Diſtance of the Planet from the Earth A ♂,
To the Diſtance of the Planet from the Sun ☉ ♂,
So is the Tang. of the Inclination, or Lat. ſeen from the Sun C ♂,
To Tang. Lat. ſeen from the Earth, = Angle C B ♂, *&c.*

3. In the Operation for finding the Planets Longitude, you have generally a right-lin'd Triangle form'd, which is either right-angled, or elſe Oblique: Which Sides take diſtinctly, and lay them down upon Paper: Then take the Planet's Aphelial Line, and Semidiameter of the Earth's Orb in your Compaſſes, and to this Extent ſet the Radius of the Two Indexes (for they repreſent the two Legs of a Sector:) They reſting thus, take each Side of your Triangle, that you had juſt now reſerv'd on Paper in your Compaſſes, and apply them ſeverally parallel upon the Indexes, and you have the Diſtances of the Planets from the Earth; which multiply'd by 3989.58, gives the Diſtances ſeverally in *Engliſh* Miles.

Note, The reaſon of laying the Two Threads parallel, is grounded upon the *29th* and Firſt of *Euclid*; where it is demonſtrated, that if a Line cut two parallel Lines, the Alternate Angles will be equal.

This following Table of the greateſt Diſtance of the Planets from the Sun, in Semidiameters of the Earth, being put upon the Indexes of each Planet's Inſtrument, as a Line of Lines on the Sector, will give the Diſtances of the Planets from the Sun or Earth at all times, in Semidiameters of the Earth; as is ſhewn in Page 24, Paragraph 3.

♄	152454	To be put on the Index of each Planet.
♃	88722	
♂	36641	
⊖	27748	
♀	23767	
☿	20166	

☽'s	Apog.--65 *ferè*		Diſtance from the Earth in Semidiameters of the Earth.
	Mean--60	$\frac{100}{185}$	
	Perig.--56	$\frac{53}{185}$	

Theſe things being known, I ſhall next proceed to give an Example.

Anno 1725, *Apr.* the *26th* Day at Noon, I would know the Heliocentrick and Geocentrick Place of *Saturn* in Longitude and Latitude, his Diſtance from the Earth and Sun, together with the Elongation, Commutation and Parallax of the Earth's Orb, and alſo what Day of the Week it is?

OPERATION.

	W.D.	Anom. ⊖.	Anom. ♄.
Anno 1725	4	369	492
April	0	2464	84
Day 26	5	712	24
Sum	2	3545	600

Note, W. D. ſignifies Week-Days.

The Days of the Week are to be number'd thus:

Sunday,	*Monday*,	*Tueſday*,	*Wedneſday*,	*Thurſday*,	*Friday*,	*Saturday*.
1.	2.	3.	4.	5.	6.	7, or 0.

By the Work above, I ſee that the given Day of the Week is *Monday*, which is noted by the Second Day of the Week. Then I move the Earth's Index to her Anomaly 3545, and it cuts her Place in ♏ 16° 46′. Alſo I move *Saturn*'s Index to his Anomaly 600; and the Edge that comes from the Center, cuts his Heliocentrick Place ♑ 17°. The Indexes thus remaining, I lay the Thread from *Saturn* to the Earth; and the Thread from the Center, I lay parallel unto it: Then the ſaid Central Thread cuts the Circle mark'd with the 12 Signs, in 22° ⅓ ♑, his Geocentrick Place in Longitude Retrograde, with 12′ N. Lat. Inclination 13′ N. And thus, as the Indexes and Thread lye, they form the Triangle, [See Fig. 3.] By which is ſhewn,

The Angle	⊖ ☉ ♄	119° 40′ Comp.	60°	20′	Commutation.
	☉ ⊖ ♄		114	24	Elongation.
	☉ ♄ ⊖		5	16	Parall. ⊖'s Orb.
		Sum	180	00	Proof.

Note, The 119° 40′ is the Angle at the Center, ſuppoſing the Sun to move, and an Index laid to the Sun's Place, which is always in Oppoſition to the Earth's Place.

And the Diſtances	♄ ☉	135	Semidiameters of the Earth.
	♄ ⊖	126	
	⊖ ☉	15	

Which multiply'd by 3989.58, gives Miles. And I ſay, the Angle A ☉ ♄ is equal to the Angle ☉ ♄ ⊖; becauſe ♄ ⊖ and A ☉ are Parallel, *per* 29*th* of the Firſt of *Euclid*.

The Theory of JUPITER.

JUPITER is the next Planet to *Saturn*, and appears thro' the Teleſcope to have always a round full Face. He is liable to be hid from our Sight by all the Planets except *Saturn.* He makes one Revolution round his Orb in 11 Years, 317 Days, 12 Hours, 20′ 25″. He is ſometimes Direct, Stationary, and Retrograde to us at the Earth, and makes all his Aſpects with the Sun. His Mean Diurnal Motion is 4′ 59″; according to which, every 398 Days, or one Year and 33 Days, he is in Conjunction with the Sun; and then, if near his Aphelion, is diſtant from the Earth 88722.2 Semidiameters of the Earth, = to *Engliſh* Miles 353964314.676. He is attended with Four Moons, or Satellites, which I have drawn upon one Corner of the Inſtrument: They paſs thro' *Jupiter*'s Shadow once in every Revolution; but that Shadow doth not reach ſo far as to the Orb of *Saturn.* The Diſtances of his Four Satellites from his Body, according to the Obſervations of our Renown'd Aſtronomer Mr. *Flamſteed*, are,

1.	2.	3.	4.
5.578	8.876	14.154.	24.903

Semidiameters of *Jupiter*.

And their Periodical Times round him are,

		D.	H.	′	″		
1	in	1	18	28	36	Magnitudes	2
2	in	3	13	17	54		3
3	in	7	3	59	36		1
4	in	16	18	5	12		4

By theſe Magnitudes, and their Diſtances from the Body of *Jupiter*, they may be eaſily known: But if you obſerve them with a Teleſcope of only Two Convex Glaſſes, which inverts the Object, they always appear on the contrary Side of *Jupiter*: Which Caution I thought good to give.

Every Satellite is in One Revolution twice hid from an Obſerver on our Earth, beſides when it falls into *Jupiter*'s Shadow; as ſuppoſe the Earth at A; when the fourth Satellite comes to *a*, it being then in Conjunction with *Jupiter*, cannot be ſeen by the Obſerver, becauſe it appears then in the Body of *Jupiter*. Alſo when it comes to *b*, and ⊖, as before at A, it being then in Oppoſition with *Jupiter*, it falls beyond his Body, and ſo becomes inviſible.

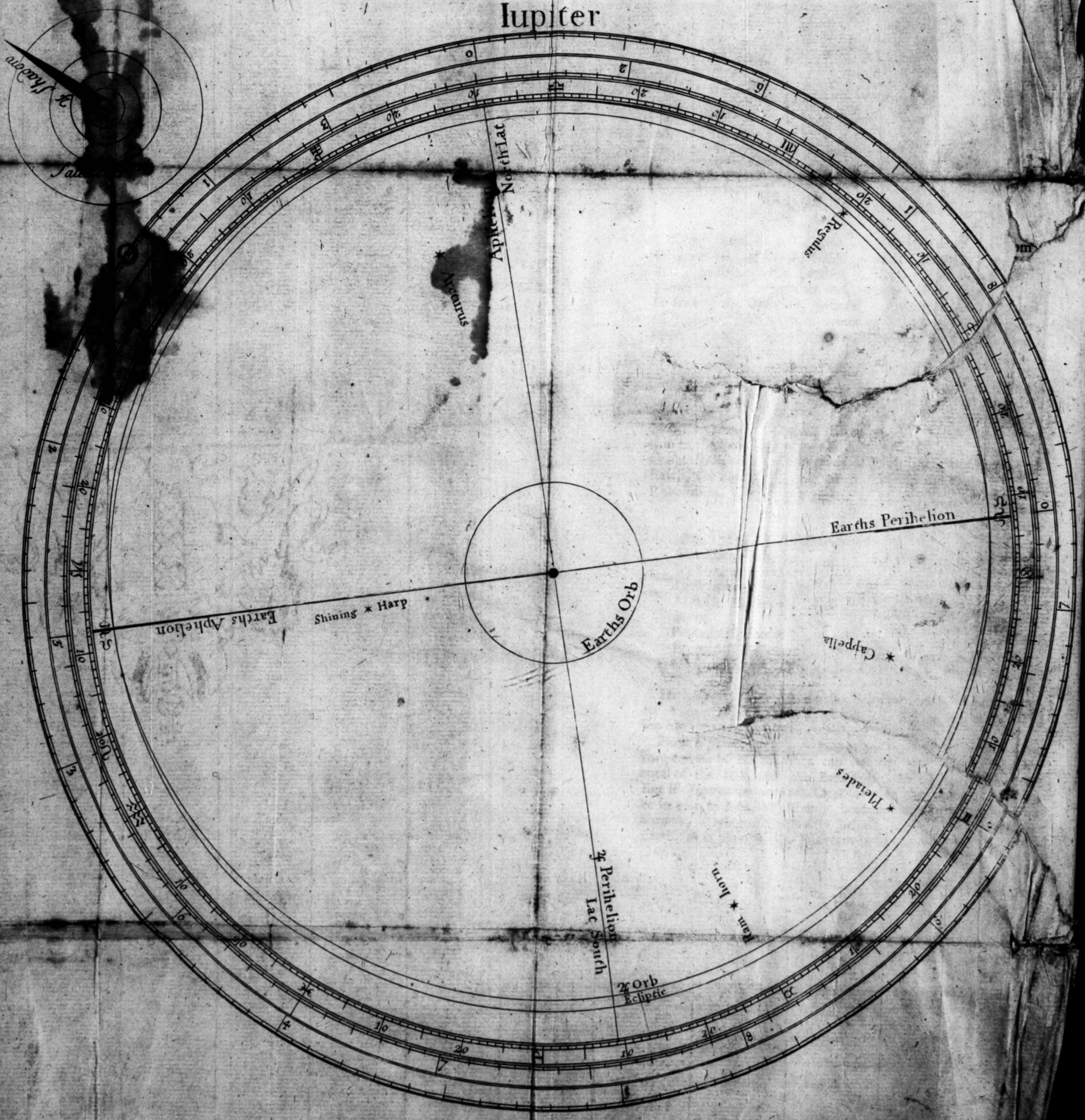
But, contrary to this Doctrine, Mr. *Flamſteed*, in *Philoſ. Tranſact.* N°. 154, Page 411, tells us, that the fourth Satellite may have Lat. ſo as to free it from falling into *Jupiter*'s Shadow; as he ſays, it had in the Months *October*, *November* and *December* 1684. When the Earth is at D, *Jupiter* is in Oppoſition to the Sun; but when the Earth is at C, then *Jupiter* is in Conjunction with the Sun; and in both theſe Poſitions of the Earth, the Satellite is only twice hid from the Obſerver in one Revolution. [See Fig. 4.]

		°	′	″
Anno 1725, ♃'s Aphelion was in	♎	9	4	0
Aſcending Node in	♋	7	23	0
Its Motion in a Year				13
Inclination of the Orb		1	22	0
Aphelial Diſtance				545011
Mean				520110
Perihelial Diſtance				494926
Eccentricity				25050
He turns once round upon his Axis in		9h.	56!	0″

He is greater than our Earth 577 times; and his Semidiameter 6054; of ſuch Parts as the Earth's Semidiameter is, 727; but his apparent Semidiameter is 24″.

He is a Planet of a very fulgent and beautiful Aſpect. The Immerſions of his Satellites can only be ſeen when he is Oriental of the Sun, and the Emerſions when he is Occidental: But if *Jupiter* be in exact Oppoſition to the Sun, it will then be in vain to look for either; becauſe you cannot then ſee his Shadow, it lying all perfectly behind him to an Eye at our Earth, as is plain by the Diagram before-cited.

Iupiter



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By help of the Teleſcope, Aſtronomers have diſcover'd in the Body of *Jupiter* ſeveral Belts or Girdles, [See Fig. 5.] which ſurround him ; but neither keep the ſame Diſtance, nor Magnitude.

Theſe being the chief Phænomena of this Planet, I ſhall next ſhew the Uſe of theſe Numbers and Inſtrument, in finding his Place at all times.

Example. *Anno* 1725, *April* the 26th Day at Noon, I would know the Place of *Jupiter* by the Inſtrument.

The Work ſtands thus:

	W. D.	Anom. ⊖.	Anom. ♃.
Anno 1725,	4	369	3790
April	0	2464	209
Day 26,	5	712	60
Sum	2	3545	4059

The Day of the Week is *Monday*. The Indexes laid to their reſpective Anomalies (as directed in *Saturn*) will give his Longitude ♓ 12°. ⅔, and Lat. 1°. South. The Indexes and Threads reſting thus, there is a right-lin'd Triangle form'd, in which there are given two Sides, and the Angle included, to find the other two Angles. [See Fig. 6.] in which,

		°	′	
The Angle	⊖ ☉ ♃	105	18	Commutat. or Angle at the Sun.
	☉ ⊖ ♃	64	13	Elongat. Sub. from the Sun's Place.
	☉ ♃ ⊖	10	29	Parallax of ⊖'s Orb, add to Ecliptic, or Heliocentric Place, becauſe the Angle at the Sun is leſs than 180°.
Sum		180	00	

Note, The Mean Conjunction of *Saturn* and *Jupiter* are made every 19 Years, 312 Days, and 8^s. 2°. 48′ diſtant from the laſt Conjunction. [See the Table of *Mean Conjunctions*.]

The Theory of MARS.

THIS Planet moves in an Orb between *Jupiter* and our Earth, and is of a Fiery Red Colour; 'tis ſuppos'd, he has an Atmoſphere like ours, as is argu'd from the Phænomena of the Fix'd Stars appearing obſcur'd, and, as it were, extinct, when they are ſeen near his Body; and thro' the Teleſcope his glaring Light makes but a confus'd Appearance, as I have often obſerv'd. He comes very near our Earth, when in Oppoſition to the Sun, as is plain by the Inſtrument; at which time I make his Horizontal Parallax 37″ 34‴. He makes One Revolution round the Sun in one Year, 321 D. 23 H. 27′. 30″. He is Direct, Stationary and Retrograde to us at the Earth, and makes all the Aſpects with the Sun. His Mean Diurnal Motion is 31′ 27″: According to which Middle Motion, there are two Years and fifty Days between every Conjunction with the Sun; and then, if in his Aphelion, is diſtant from the Earth 36630.7 Semidiameters of the Earth, = to 122440508.106 *Engliſh* Miles.

This Planet (as well as all the reſt) borrows all his Light from the Sun, and has his Increaſe and Decreaſe of Light like our Moon; and when three Signs diſtant from the Sun, or in his Perigeon, is almoſt biſſected: And *Ricciolus* is of opinion, that if he could be ſeen in Conjunction with the Sun, we might diſcern him to be Horn'd; and when he is in Perigeon, he is nearer the Earth than either *Venus*, or *Mercury*, or the Sun himſelf.

		°	′	″
Anno 1725, his Aphelion is	♍	0	27	0
Aſcending Node	♉	18	13	0
Its Motion in a Year				43
Inclination		1	51	0
Aphelial Diſtance				166385
Mean				152369
Perihelial Diſtance				138199
Eccentricity				14100

He turns once round upon his Axis in 24 h. 40′

He is leſs than our Earth 15 times; and his Semidiameter is 296, ſuch Parts as the Earth's Semidiameter is 727: But his Apparent Semidiameter, 4″. He has not any Satellites, as *Saturn*, *Jupiter* and our Earth have. But Monſieur *Hugens* in the Year 1656, obſerv'd a broad obſcure Zone, or Belt to ſhadow near half his Disk. He is liable to be Eclips'd by the Sun, *Venus*, *Mercury* and the Moon, as to the Appearance ſeen from our Earth.

Theſe being the chief Phænomena of this Superiour Planet, (for *Saturn*, *Jupiter* and *Mars* are call'd Superiours, becauſe the Earth's Orb is contain'd within their Orbs; and *Venus* and *Mercury* are call'd Inferiours, becauſe their Orbs are contain'd within the Earth's Orb:) Theſe things being premis'd, I come now to ſhew the Uſe of the Numbers and Inſtrument, in finding the Place of *Mars*, &c.

Example. *Anno* 1725, *April* the 26*th* Day at Noon, under the Meridian of the Tables, I would know the Place of *Mars* in Longitude and Latitude, *&c.*

OPERATION.

	W. D.	Anom. ⊖.	Anom. ♂.
Anno 1725,	4	369	3665
April	0	2464	1310
Day 26,	5	712	378
Sum	2	3545	5353

The Day of the Week is the Second, or *Monday*; and the Indexes and Threads laid to their reſpective Anomalies, will give the Longitude of *Mars* 11° ♈, with 1° 5′ South Latitude deſcending: And entring the Table of Inclination with the Anomaly 5353, it gives the Latitude ſeen at the Sun 1° 13′ South. The Threads and Indexes reſting thus, there is form'd an Oblique Angl'd plain Triangle; [See Fig. 7.] in which,

The

		°	′	
The Angle	⊖ ⊙ ♂	119	6	Commutat. or Angle at the Sun.
	⊙ ⊖ ♂	35	43	Elongat. or Angle at the Earth.
	⊙ ♂ ⊖	25	11	Parallax of the Earth's Orb, or Angle at *Mars.*
Sum		180	00	

Example 2. What's the Place of *Mars* the *29th* Day of *Auguſt*, 1725, at Noon? And what's the Week-Day?

The Work ſtands thus:

	W. D.	Anom. ⊖.	Anom. ♂.
Epocha 1725,	4	369	3665
Auguſt	3	5804	3086
Day 29,	1	794	422
Sum	1	6967	7173

The Day of the Week is the Firſt, or *Sunday*; and the Earth's Index laid to its Anomaly, in the Middle divided Circle, gives its Place in *Piſces* 16°. 38′. And *Mars's* Index laid to his Anom. 7173, in the Outmoſt Circle, gives his Heliocentrick Place in *Taurus* 29°. 20′. And the Geocentrick, in *Cancer* 7°. 53′. with 21′. Lat. N. A. And alſo is given

		°	′	°	′	
The Angle	⊖ ⊙ ♂	107	18=	72	42	Commutation.
	⊙ ⊖ ♂			68	45	Elongation Sub.
	⊙ ♂ ⊖			38	33	Parallax, add.
Sum				180	00	

Note, the 107 Degr. 18 Min. is the Angle at the Center, ſuppoſing the Sun to Move, and an Index laid at the Sun's Place.

13 JUN

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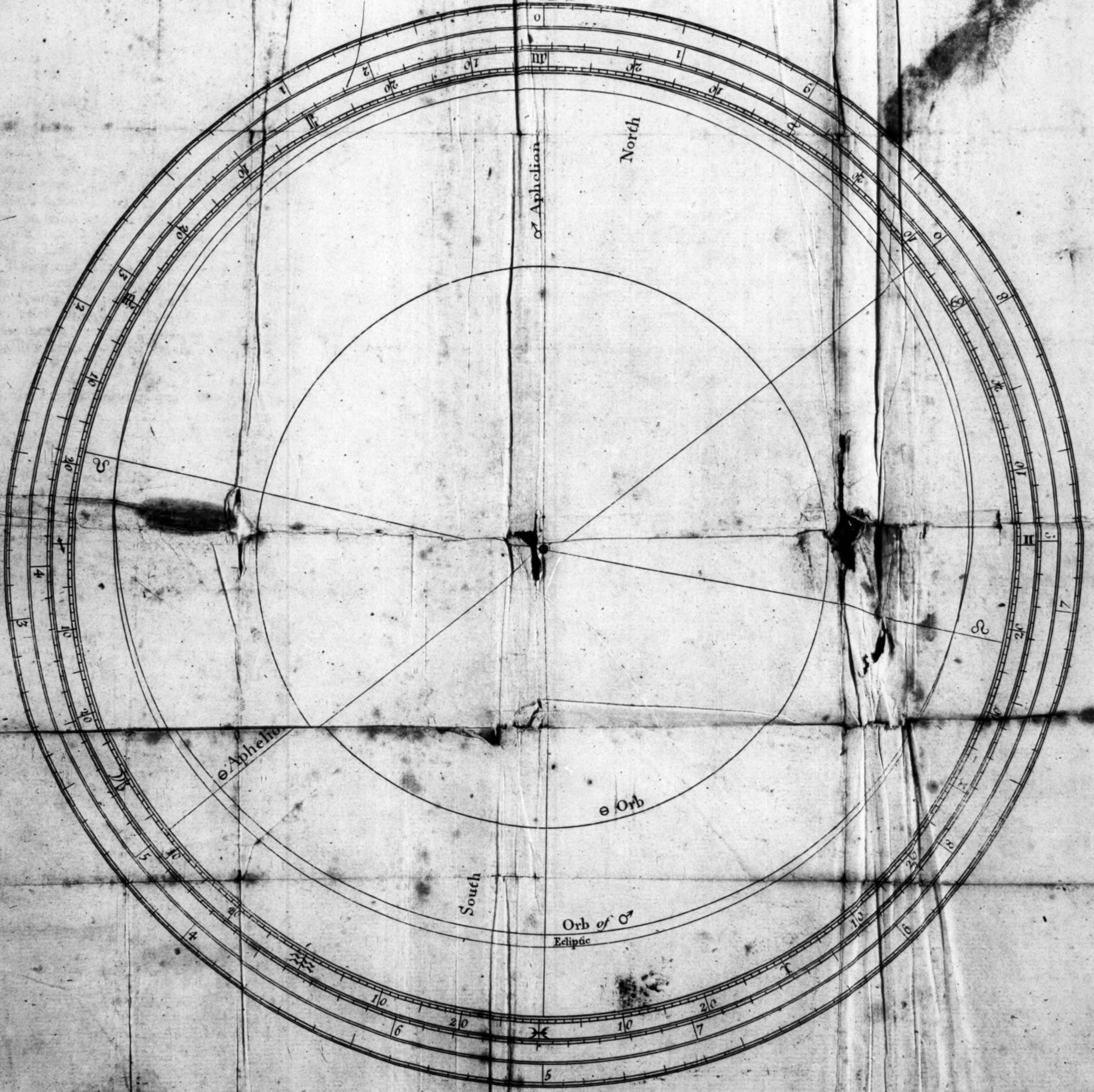
Mars



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The Theory of the EARTH.

NExt below *Mars*, is our Earth plac'd in the Syſtem, who performs One Revolution round the Sun in 365 Days, 5 Hours, 48 Min. 57 Sec. always in *Conſequentia*, or according to the Order of the Signs. This is call'd the *Natural* or *Tropical Year*; but the Sydereal Year is ſomething longer, *viz.* by the Præceſſion of the Equinox, 50″. [*See Year.*] Beſides this Annual Motion, ſhe has a ſecond Motion upon her own Axis, call'd her *Diurnal*, which, in reſpect to the fix'd Stars, is perform'd in 23 Hours, 56 Min. but in reſpect of Time, in 24 Hours nearly, from Weſt to Eaſt: This is the Cauſe of Day and Night, and the Riſing and Setting of the Heavenly Bodies. A * Third Motion the Earth has, which is, from South to North, and from North to South, in reſpect of the Equinoctial, which makes an Angle with her Orbit of 23 Degrees and half; but Mr. *Flamſteed* makes it only 23° 29′ ¼. and this is call'd by the *Copernicans*, the Earth's Reflection; but by the *Ptolemaicks*, the Sun's Declination.

* *This Motion is in reality the Annual.*

The Year 1725, the Earth's Aphelion was		♑ 7°. 35′. 12″.
Aphelial Diſtance		101732
Mean		100000
Perihelion Diſtance		98268
Eccentricity, according to	Mr. *Street*,	1732
	this Author,	1721
	Mr. *Flamſteed*,	1692
Præceſſion of the Equinox		50″

The Earth is 258309 times leſs than the Sun.

Earth's greateſt Diſtance from the Sun	13993	Semidiameters of the Earth.
Mean	13755	
Leaſt Diſtance	13517	

13755000
51,020,000

The Earth's Circumference	25035.84	*Engliſh* Miles.
Diameter	7969.16	
Height of the Earth's Atmoſphere	47.12	

But the Semidiameter of the Earth, as view'd from the Sun, is only 10 Seconds, equal to the Sun's Horizontal Parallax.

The Earth has one Satellite, *viz.* the Moon ; which I ſhall ſpeak of when I come to her Theory.

The Earth being an Opake Body, muſt of neceſſity caſt a Shadow ; and becauſe this Terraqueous Body is nearly Spherical, conſequently her Shadow muſt be Conical, whoſe Vertex is always diametrically oppoſite to the Sun, but doth not reach ſo far as the Orb of *Mars* : For when the Earth is at a middle Diſtance from the Sun, the Length of the Earth's Shadow is 214 Semidiameters of the Earth, and the Length of the Moon's Shadow 58 : Which, how to calculate, I have ſhewn elſewhere. This Theory of the Earth is concern'd in the Inſtruments of all the Planets, which muſt be carefully minded : And her Place is ſhewn in the Calculation of the other Planets ; wherefore 'tis omitted here.

The Sun is nearer the ⊖ every Day at Noon than at Riſing by ⊖'s Semidiam.

That all the Heavenly Bodies are nearer to any Place on the Earth when on the Meridian, than at their Riſing or Setting, [See Fig. 8.]

Let *c b d e* be the Ecliptick, *b e* the Meridian, *c a d* the Viſible Horizon, *c* G *d* the true, G *a* the Earth's Semidiameter, equal to 3984.58 *Engliſh* Miles ; the Sun truly riſing at *c*, (for the Difference between the true, and viſible Riſing, in this Caſe is inſenſible) and coming up to *b* at Noon, 'tis plain that *ab* is leſs than G *b* by G *a*, which was to be prov'd.

Since I have here invented an Inſtrument which ſolves the Phænomena of the Heavens, according to the *Copernican* Syſtem, it will not be amiſs to add a Word or two in Defence thereof.

That the Earth has a Motion, and the Sun is at reſt in the Center of the Univerſe, is what we believe to be an undoubted Truth ; which I ground upon theſe Demonſtrations :

1. From the Retrogradations of the Planets.

2. That *Venus* is never more than 48 Degrees, and *Mercury* never more than 28 Degrees from the Sun; which could not be, if the Earth were at reſt in the Center of the Univerſe.

3. That *Venus* and *Mercury* conjoyn'd with the Sun, by a Retrograde Motion paſs between the Earth and Sun: Which could not be, if the Earth were at Reſt in the Center of the Univerſe.

4. That the Comets have a free Paſſage thro' the Orbs of all the Planets: Which they could not have, if the Orbs were Solid, as the *Ptolemaicks* vainly imagine.

Now the Places of Scripture which ſeem to oppoſe this, are of two kinds. *Firſt*, Such as imply a Motion in the Heavens; Or, *2dly*, Such as ſeem to expreſs a Reſt and Immobility in the Earth. To this I anſwer in general;

Gen. 12, 17. *and* 32, 31. Mat. 1. 32

That the Holy Ghoſt in theſe Scripture-Expreſſions, is pleas'd to accommodate himſelf to the Conceit of the Vulgar, and the uſual Opinion. Whereas, if in the more proper Phraſe, it had been ſaid, that the Earth did riſe and ſet; or, that the Earth ſtood ſtill, *&c.* the People, who had been unacquainted with Aſtronomy and Philoſophy, would not have underſtood the Meaning of it; and therefore it was convenient that they ſhould have been ſpoken to in their own Language: For the Scripture ſpeaks all along according to the Appearance of Things, and the Vulgar Capacities, and not in reality as they are. As, for Inſtance, 1 *Kings* 1. 40. At the Anointing of King *Solomon*, *All the People came up after the King, and piped with Pipes, ſo that the Earth rent with the ſound of them.* Here, it is not to be ſuppos'd that the Sound of a Pipe, or the Noiſe of Men could rend the Earth; but this is ſpoken according to Vulgar Apprehenſion.

Deut. 32, 42.

Moſes did not ſo much regard the Nature of the Thing, as our Capacity: Whoſe Intent was not to teach Aſtronomy, but to propound a Doctrine that concerns the moſt rude and ſimple People. And here the Moon is call'd a Great Light, which is well known to Aſtronomers to be no Light at all; but is ſo ſpoken to mean Capacities, becauſe it appears ſo to them.

Gen. 1. 16. Pſal. 136. 7. Exod. 17. 12. Iſa. 13. 10 *and* 24. 19, 20.

The Vulgar likewiſe think that the Sun moves, and the Earth ſtands fix'd in the Center of the Univerſe; for which they think they have alſo theſe following Texts of Scripture on their ſide, *viz.* *Joſ.* 10. 12. 2 *Kings* 20. 11. *Iſa.* 38. 8. *Pſal.* 19. 5, 6. and 102. 25. and 121. 6. *Job* 38. 4. *Jonah* 4. 8. *Mark* 1. 32. *Heb.* 12. 26. All which Places ſpeak of the Sun's Riſing and Setting, and of the Earth's being fix'd: But theſe are to be underſtood according to the Appearance of things, and not really as they are: For the Common People do uſually judge rather by their Senſe than by their Reaſon. I may ſay, a Candle is a greater Light than a Star, or the Moon, becauſe it is really ſo to me. In 1 *Kings* 7. 23. it is ſaid, that *Solomon's* Molten Sea was Ten Cubits from one Brim to the other, and that a Line of Thirty Cubits did compaſs it: Whereas it is well known to Geometricians, that if the Diameter was 10, the Circumference will be 31.4159. Now, what ſays my Antagoniſt to this? And as for the *Ptolemaicks*, they have an Objection againſt the Earth's Motion, which is this, *viz.*

When the Sun is in *Cancer*, you ſay the Earth is in *Capricorn*; then how comes it to paſs, that you ſee the Sun to the South of your Habitation? For if the Earth be in *Capricorn*, according to your own Propoſition, you ſhould behold the Sun to the Northward of you.

To this I anſwer, that the Earth bearing no ſenſible proportion to the immenſe Diſtance of the Fix'd Stars, as being but a Point, (as I have obſerv'd before) cauſes ſuch an Appearance, its Magnitude being no more than the Eye of the Spectator: But when we compare the Diſtance of the Sun and Earth, to the Earth's Magnitude, we find it otherwiſe: So that here the Earth becomes more than a Point, in reſpect to its Diſtance from the Sun; and therefore cauſes an Elevation or Depreſſion of the Poles of the World, according as the Vertex of any Place is remov'd nearer, or farther off the Equator. So that when the Earth is in *Capricorn*, and the Latitude of your Place more than 23° and half North, the Sun will then be to the South of you: But if your Latitude be South, or North leſs than 23° and half, the Sun will be to the Northward of you; which is evident from the *Copernican* Projection: Therefore it depends only upon the Situation of your Habitation. And ſo likewiſe to thoſe that live 50 or 60° to the South of the Equator; and the Earth in *Cancer* will behold the Sun to the Northward. Which Objection is alſo anſwer'd by what I have juſt now ſaid: For according to the different Situation and Motions of the Spectator, the Appearances of things will be very different. And now I ſhall conclude the Earth's Theory with a Word or two in defence of its Motion.

1. Thoſe who ſail in a Ship, perceive not the Motion of the Ship; but external Objects without the Ship will ſeem to move.

2. A Ball of Lead, &c. being let fall from the Top-Maſt-Head, the People in the Ship will obſerve it to fall juſt by the Foot of the Maſt, all one as if the Ship were at reſt; for the Ball and Maſt are both mov'd with the ſame Velocity, and will always be at the ſame Diſtance. Alſo, an Artificial Fountain that is made to play, and mov'd along any Place, the Water will always fall upon or near the Fountain: For the ſame Reaſons, we on the Earth cannot perceive its Motion: And a Cannon-Ball ſhot up perpendicularly into the Air, will fall near the Cannon; for all Bodies ſhut up in any one Place, preſerve the ſame Motion in regard of one another.

For if the Sun did move round the Earth, as the *Ptolemaicks* and *Tychonicks* affirm; then the univerſal Law of Nature would thereby be violated, the Harmony and Proportion of the Motions deſtroy'd, and a Confuſion and Diſorder introduc'd into the Frame of the Univerſe.

It was *Kepler* that firſt diſcover'd that the Squares of the Periodical Time of all the Heavenly Bodies are as the Cubes of their mean Diſtances from the Center of their Orbits, about which they perform their Motion regularly: But it was never demonſtrated, till the great Sir *Iſaac Newton* took it into conſideration. And ſince the Moon moves round our Earth, if the Sun did likewiſe move round it, according to this Law of Nature, the Moon and Sun ought to regulate their Motions in the ſame manner: And therefore becauſe the Moon finiſhes one Revolution in 27 Days, and the Sun in 365, (I omit the odd Hours) and the Diſtance of the Moon is 60 Semidiameters of the Earth, I ſay, as □ 27 : □ 365 : : Cube 60 : 39474074, whoſe Cube-Root is 340, which ſhould be the Diſtance of the Sun from the Earth, if the Earth were fix'd, and the Sun mov'd round it: But by undeniable Principles in Geometry, I prove the Sun to be 13617 Semidiameters from the Earth, at a middle Diſtance from it: Therefore it would be more than 253 Years in per-forming one Revolution ; which proves it to be fix'd, and the Earth to move.

In the next place, I ſhall ſhew, how by the *Crepuſculum* or Twilight to determine the true Height of our Atmoſphere ; which is like a Husk, or Shell ſurrounding the Earth on every Side.

Let A D B be half of the Earth's enlighten'd Hemiſphere, D our Sub Zenith, E the Sun when depreſs'd 17° 27′ below the Horizon (that is, allowing 33′ for Refractions) D G our Horizontal Line, G E an Horizontal Line of Sun-ſet to them at E ; biſſect the Arch D E in G : So is there two right-angled Triangles, *viz.* D C G=G C E, whoſe Quantity is 8° 43 ½ : Let C be the Earth's Center, C F=C D=C E the Earth's Semidiameter, 3984.58 *Engliſh* Miles ; the Height of the Atmoſphere is F G : To find which in the right-angl'd plain Triangle C F G, I ſay, [See Fig. 9.]

As S. Angle C G E	81° 16′ 30″	9.994945
To C E the ⊖'s Semidiameter	3984.58	3.600383
So Radius	90 00 00	10.000000
To C G	4031.7	3.605438
Earth's Semidiameter Sub. C F	3984.58	
Remains F G	47.12	which is the

Height of the Atmoſphere in *Engliſh* Miles.

And if you would know, what Proportion its Height bears to the ⊖'s Semidiameter, you will find it to be as 1 to 84.56. So is the Height of the Atmoſphere to the Earth's Semidiameter, thus 47.12)3984.580(84.56.

The Diameter of the Earth may be known, by having the Height of ſome very eminent Mountain, as the Pike of *Teneriffe*, &c. by the 36*th* of the 3*d* of *Euclid.* [See Fig. 10.]

Let the Circle repreſent the Convexity of the Terraqueous Globe, *d a* the Height of the Pike : Being on the Top at *a*, with a good Quadrant obſerve the Sun or Moon in the Horizon, at *b* ; and take the Angle *c a b*, which I'll ſuppoſe to be 88 Degrees 11 Min. Then where the Tangent, or viſible Ray *a b* touches the Horizon at *b* ; to it, I ſay, draw *c b* ; then in the right-angl'd plain Triangle *a b c*, having the Angle at *a* 88 11, that at the Earth's Center is alſo known to be 1° 49′: Draw *d b*: Then in the Equicrural Triangle *c d b*, the Angles at *d* and *b* will each of them be 89° 5′ ½ whoſe Complement to 180, is the obtuſe Angle *a d b* 90° 54 ½; and conſequently the Angle *a b d* is 0° 54′ ½. Now in the Triangle *a d b*, I find the viſual Ray *a b* to be 126 Miles, and the Height of the Pike 2 Miles. Now, in the right-angled plain Triangle *a b c*, right-angled at *b*, there it gives all the Angles, with the Side *a b*, to find *c b* the Earth's Semidiameter? And if you make *c b* Radius, it will hold. As *t* Angle *c*: To *b c*:: So Radius *c b*.

Or the Angle *c a b* being taken, and the Mountain's Height being known, the Earth's Radius *c b* may be had without knowing the Diſtance *a b*: For in the Triangle *a b c*, all the Angles are known; and the Length *d a* is only the Exceſs of the Secant *c a* above the Radius *c b* or *c d*. For Radius is a mean Proportional between the Sine of an Ark, and the Secant Complement of the ſame Ark.

Laſtly, Before I take my leave of the Superiour Planets, to compleat the Theories of *Saturn* and *Jupiter*, I ſhall here ſubjoyn a Table of the Mean Conjunctions of thoſe Planets, borrow'd from Philoſoph. Tranſact. Numb. 149, done by the Great Mr. *Flamſteed*.

Anno 1683, *Jan.* 14 D. 12 H. in the Meridian of *London*, the Mean Motions of both the Planets were 4 S. 11° 45′; This is the Radius of the following Table. Then, to find the time of any Mean Conjunction paſt, or to come, neareſt to any Place of the Zodiack.

For times paſt, ſubtract the Longitude of the given Place, from the Longitude of the Radix 4 S. 11° 45″, the Reſidue ſeek in the laſt Column of the Table: If you find not the preciſe Number, take the next to it (more or leſs;) againſt this you have in the ſecond Column, the Years and Days, and in the firſt the Number of Conjunctions paſt, ſince any was made in that Place of the Zodiack. Subtract the Years and Days from 1683, *Jan.* 14, ſo you have the true time of the Mean Conjunction, and Longitude of the Planets.

But for times to come, ſubtract the Radix from the given Place: Seek the Reſidue as before, in the laſt Column: If you find it not, take that you find neareſt it; againſt which, as before, you have in the ſecond Column the Years and Days, and in the firſt Revolutions to come.

EXAMPLE.

Let it be requir'd to know the time of the laſt Conjunction in the firſt Degree of ♒?

See the Work.

	S.	°	′
Radix	4	11	45
Given Place	10	00	00
Remains	6	11	45
The neareſt to this in the Table is	6	12	56

	Y.	D.	
And in the ſecond Column	516	57	Subt.
Radical Year	1683	14	borrow 365 Days.

Remains 1166 322 *November* 18. And ſubtracting the Motion found in the Table 6 12 56 from the Radix 4 S. 11° 45, it gives the Place in 9 S. 28° 49′.

2*dly*, Let the Time and Mean Place of the firſt Conjunction in ♎ to come, be requir'd?

OPERATION.

	S.	°	′
From the given Place	6	00	00
Radix Subt.	4	11	45
Remains	1	18	15

Neareſt to this in the Table, is 18 Revolutions, and 357 Years, 124 Days; and Mot. 1 S. 20° 29′

Add	357 Y.	124 D.
To the Radical Year	1683	24
Time of this Mean ☌ is *Anno*	2040	138 *May* 18.

And adding 1 S. 20° 29′ to the Radical Place 4 S. 11° 45′ the Sum is 6 2 14, the Mean Longitude of this Conjunction.

And he alſo tells us in the ſame Tranſactions, Page 253, that all, or the beſt eſteem'd Aſtronomical Tables extant, make the Motion of *Saturn* too ſwift, and of *Jupiter* too ſlow conſiderably. Hence it comes to paſs, that their Direct Conjunction is ſome Days later, the Retrograde earlier than they are found by Obſervation.

And here I ſhall ſet down the Mean Times of the Leaſt, Middle and Greateſt Conjunctions of theſe two Planets, which are thus:

		Y.	D.
Leaſt	Conjunction of ♄ and ♃ is made in	19	312
Mean		198	249
Greateſt		855	317

Note, The leaſt Conjunctions are ſuch as happen in Signs of the ſame Triplicity.

The Mean or Middle Conjunctions are ſuch as are made after the leaving one Triplicity, and joyning in the next.

The Great Conjunction is one Compleat Revolution of the Conjunction of *Saturn* and *Jupiter* thro' the Four Triplicities or 12 Signs of the Zodiack.

Fiery	♈	♌	♐	Trigon, or Triplicity.
Earthy	♉	♍	♑	
Airy	♊	♎	♒	
Watry	♋	♏	♓	

A Table of the Mean Conjunctions *of* Saturn *and* Jupiter, *with their* Intervals *and* Motions.

Revolutions Compleat.	*Years*	*Days*	*Motion.* S.	°.	′.	*Revolutions Compleat.*	*Years*	*Days*	*Motion.* S.	°.	′.
1	19	312	8	2	48	25	496	111	10	0	8
2	39	258	4	5	37	26	516	57	6	12	56
3	59	204	0	8	25	27	536	3	2	15	44
4	79	150	8	11	13	28	555	315	10	18	32
5	99	96	4	14	1	29	575	261	6	21	21
6	119	42	0	16	50	30	595	207	2	24	9
7	138	353	8	19	38	31	615	153	10	26	57
8	158	299	4	22	26	32	635	99	6	29	45
9	178	245	0	25	15	33	655	45	3	2	34
10	198	191	8	28	3	34	674	356	11	5	22
11	218	137	5	0	51	35	694	302	7	8	10
12	238	83	1	3	40	36	714	248	3	10	59
13	258	29	9	6	28	37	734	194	11	13	47
14	277	340	5	9	16	38	754	140	7	16	35
15	297	286	1	12	4	39	774	86	3	19	24
16	317	232	9	14	53	40	794	32	11	22	12
17	337	178	5	17	41	41	813	343	7	25	0
18	357	124	1	20	29	42	833	289	3	27	49
19	377	70	9	23	18	43	855	235	0	0	37
20	397	16	5	26	6						
21	416	327	1	28	54						
22	436	273	10	1	43						
23	456	219	6	4	31						
24	476	165	2	7	19						

The Theory of VENUS.

VENUS is call'd one of the Inferiour Planets, as moving in an Orb between the Earth and *Mercury*. She is the moſt ſplendid of all the Primary Planets, moves round the Sun in the Space of 224 D. 16 H. 49′ 24″, and is never found further from him than 48°. Her mean Diurnal Motion is 1° 36′ 7″; according to which, there are 584 Days, or one Year and 219 Days between one Conjunction and another with the Sun of the ſame kind. What is meant by a Conjunction of the ſame kind, you are to underſtand, that when **Venus* is conjoyn'd with the Sun by a direct Motion in the ſuperiour Part of her Orb, then it will be 584 Days before ſhe is conjoyn'd with the Sun again in Apogeon; and if this Conjunction was in *Aquarius*, the next will be in *Virgo*, that is 7 Signs further: But when conjoyn'd with the Sun in the lower Part of her Orbit, ſhe is ever Retrograde, and in Perigeon; and then if her Latitude at the Earth be leſs than the apparent Semidiameter of the Sun, ſhe will then be ſeen to make a black Spot in the Sun's Disk. When this happens, I have given you an Account in my Treatiſe of Eclipſes, printed for Mr. *Sprint* in *Little Britain*. But between a Direct ☌ with the Sun, and a Retrograde ☌, there is about 300 Days. Theſe are call'd the *Mean Conjunctions* (and are 9 Signs aſunder;) becauſe they depend upon the Mean Motion of *Venus* and the Earth. When ſhe is in ☌ with the Sun in the lower Part of her Orbit, ſhe is about ſix times nearer to the Earth, than when ſhe is in the upper part of it, *viz.* no leſs than the whole Diameter of her Orb. The times of the true ☌ may be ſeen by the Inſtrument. She is Direct, Stationary and Retrograde to us at the Earth once every two Years; and when ſhe becomes Retrograde, is always Occident of the Sun. I ſhall here ſubjoyn a uſeful Table of her Retrogradations, &c. for 50 Years incluſive.

* *She is then always Oriental of* ☉

A

The time when ♀ becomes Retrograde.		♀ Longitude.			♀ Latitude.				*Time between one Retrograd. and another.*		Days Retrograde.	Sun's Place.		
			°	'	°	'			Y.	D.		°		'
1681 *May* 29,	R. Occid.	♋	15	26	1	5	N	D	1	221	44	18	♊	7
1683 *Jan.* 5,	R. Occid.	♒	22	30	3	30	N	A	1	212	39	25	♑	40
1684 *Aug.* 5,	R. Occid.	♍	20	38	5	23	S	A	1	222	41	23	♌	14
1686 *Mar.* 15,	R. Occid.	♉	4	3	6	24	N	A	1	219	44	5	♈	22
1687 *Oct.* 19,	R. Occid.	♐	3	39	5	31	S	D	1	218	42	6	♏	10
1689 *May* 24,	R. Occid.	♋	11	0	2	18	N	D	1	222	44	13	♊	25
1691 *Jan.* 1,	R. Occid.	♒	21	12	2	16	N	A	1	215	44	21	♑	39
1692 *Aug.* 3,	R. Occid.	♍	19	5	4	44	S	A	1	223	42	21	♌	23
1694 *Mar.* 14,	R. Occid.	♉	2	24	6	11	N	A	1	217	42	4	♈	26
1695 *Oct.* 17,	R. Occid.	♐	2	16	5	26	S	D	1	218	42	4	♏	13
1697 *May* 22,	R. Occid.	♋	9	18	2	2	N	D	1	223	44	11	♊	35
1698 *Dec.* 31,	R. Occid.	♒	18	43	2	2	N	A	1	214	42	2	♑	41
1700 *Aug.* 1,	R. Occid.	♍	16	48	4	28	S	A	1	224	43	19	♌	32
1702 *Mar.* 13,	R. Occid.	♉	1	47	7	7	N	A	1	217	42	3	♈	24
1703 *Oct.* 16,	R. Occid.	♐	0	15	6	5	S	D	1	217	42	3	♏	20
1705 *May* 21,	R. Occid.	♋	9	5	2	2	N	D	1	222	43	10	♊	37
1706 *Dec.* 29,	R. Occid.	♒	16	39	2	56	N	A	1	214	41	18	♑	40
1708 *July* 30,	R. Occid.	♍	16	18	5	37	S	A	1	224	42	17	♌	44
1710 *Mar.* 11.	R. Occid.	♈	29	10	7	13	N	A	1	216	42	1	♈	28
1711 *Oct.* 13,	R. Occid.	♏	28	5	6	17	S	D	1	218	41	0	♏	22
1713 *May* 18,	R. Occid.	♋	6	48	2	20	N	D	1	218	44	7	♊	48
1714 *Dec.* 26,	R. Occid.	♒	14	28	2	28	N	A	1	214	42	15	♑	40
1716 *July* 27,	R. Occid.	♍	14	0	5	16	S	A	1	224	44	14	♌	52
1718 *Mar.* 8,	R. Occid.	♈	27	3	7	9	N	A	1	216	42	28	♓	35
1719 *Oct.* 10,	R. Occid.	♏	25	39	6	28	S	D	1	220	41	27	♎	26
1721 *May* 16,	R. Occid.	♋	4	40	2	37	N	D	1	221	44	5	♊	58
1722 *Dec.* 23,	R. Occid.	♒	12	2	2	3	N	A	1	215	41	12	♑	42
1724 *July* 25,	R. Occid.	♍	11	55	5	2	S	A	1	223	42	13	♌	4
1726 *Mar.* 5,	R. Occid	♈	24	57	7	8	N	A	1	223	42	25	♓	39
1727 *Oct.* 7,	R. Occid.	♏	23	5	6	41	S	D	1	219	42	24	♎	31
1729 *May* 16,	R. Occid.	♋	2	34	2	36	N	D	1	220	44	6	♊	1
1730 *Dec.* 22.	R. Occid.	♒	9	16	1	51	N	A	1	215	41	11	♑	42
1732 *July* 25,	R. Occid.	♍	9	23	5	12	S	A	1	223	42	13	♌	5

This Planet makes no Aſpects with the Sun, ſave the Conjunction, for the Reaſon before given.

	°	′	″
The Year 1725, her Aphelion was in *Aquarius*	4	12	0
Aſcending Node in *Gemini*	14	35	0
Its Annual Motion			37
Inclination	3	23	0

Aphelial Diſtance	72791
Mean	72333
Perihelion Diſtance	71729
Eccentricity	517

Apogeon Diſtance	33634	Semidiameters of the Earth.
Perigeon Diſtance	3806	

When ſhe is Oriental of the Sun, ſhe comes to his Conjunction by a ſwift direct Motion in the upper Part of her Orb, and then is in Apogeon.

When ſhe is Occidental of the Sun, ſhe comes to Conjunction with the Sun, by a Retrograde Motion, and then ſhe is in Perigeon.

She is the moſt Regular Planet in the Heavens; the reaſon is, becauſe ſhe has the leaſt Eccentricity: For every Eight Years you may nearly find her in the ſame Place of the Heavens: Only in reſpect of Latitude, ſhe ſtrays further abroad than any other Planet. For when ſhe is Retrograde in *Aquarius*, which will be in *January* or *February*, ſhe will then have more than Eight Degrees North Latitude; [See the Table in the preceding Page.] And when Retrograde in *Virgo*, ſhe will have near Nine Degrees of South Latitude, altho' her Latitude ſeen at the Sun, be never more than 3° 23′. This is demonſtrated in Fig. 2.

I have often obſerv'd this Planet, when Occidental, and near her Perigeon, at her greateſt Elongation from the Sun, to ſhine ſo bright, as to caſt a Shadow upon the Earth; and ſhe is very often ſeen in the Day-time.

In the Hiſtory of *England*, *Fol.* 62, we are told, that at the Birth of our Glorious Monarch King *Charles* the Second (of ever bleſſed Memory) a Star appear'd at Mid-day, which was ſuppos'd by ſome to have been a New Star: But alas! it was no other than the Planet *Venus*, as you may prove by the Inſtrument, if you collect the Numbers for *May* 29, 1630, where you'll find the Week-Day *Sunday*, and *Venus* in *Taurus* 8° ⅓, with 2° ⅓ South Latitude Aſcending: She was 39° Orient of the Sun; therefore might be ſeen in the Day-time.

This Planet is obſerv'd to turn once round upon her own Axis in 23 Hours, and is three times leſs than our Earth, her Semidiameter being 509 ſuch Parts as the Earth's Semidiameter is 727: But her Apparent Semidiameter in her mean Diſtance from the Earth, is 10″ ½; her greateſt Horizontal Parallax I make to be 56″ ½. She is obſerv'd to increaſe and decreaſe in Light as our Moon doth: She is ſometimes Horn'd, ſometimes Gibbous, and at other times Full. Her Place is requir'd by the Inſtrument, *Dec.* 26, 1725.

OPERATION.

	W.D.	Anom. ⊕.	Anom. ♀.
Epocha 1725	4	369	6951
December	6	9144	4864
Day 26,	5	712	1157
Sum	1	225	2972

The Day of the Week is the Firſt, or *Sunday*; and by laying the proper *Indexes* (of the Inſtrument) to their reſpective Anomalies, as here collected, I find the Earth's Place to be *Cancer* 16 Degr. and *Venus*'s Heliocentrick Place *Taurus* 20 Degr. and half. Here I ſtay them, and bring the Thread from *Venus*'s *Index* to touch (or lye over) the Interſection of the Earth's *Index* with its Orb: Then I move the Central Thread parallel thereto, and it gives the Longitude of *Venus* ♓ 2°. Latitude 1°. 12′ S. D. and then there is given in the Triangle, *Fig.* 11;

The

		°	′	
The Angle	⊖ ☉ ♀	55	42	Commutation.
	☉ ⊖ ♀	45	58	Elongation. Add to ☉'s Place.
	☉ ♀ ⊖	78	20	Parallax of the ☉'s Orb, ſub. à ♀'s Heliocentrick Place.
Sum		180	00	

She is now Occidental, and ſhines gloriouſly in the Evening. The Place of *Venus*, as found by the Inſtrument in the laſt Work, is here demonſtrated in Fig. 11, taken from the Inſtrument.

That the Planets may be Worlds, *Heb.* 11. 3.

Note, Becauſe the Angle Earth, *Venus* and Sun, is the Parallax of the Orbit; Therefore the Angle *a*, Sun and *Venus* being made = by a Parallel Thread, by the 29*th* of the Firſt of *Euclid*; the Central Thread ☉ *a* gives the Geocentrick Place.

In the Calculation of the Planets Places from Aſtronomical Tables, there is always given the Angle at ☉, and the Sides ⊖ ☉ and ♀ ☉, *viz.* the Logarithm of theſe Sides, to find the Angle at ⊖ and Planet; which by the uſeful Demonſtration (invented by *Robert Anderſon*) is wrought without having thoſe Sides in Parts.

Thus:

1. As the Leſſer Side Is to the Greater: So Radius, To the Tangent of an Ark.
2. As the Tangent of 45°, Is to the Tangent of the firſt found Ark leſs 45°: So Tang. of half the oppoſite Angles, To Tang. of half their Difference.

Note, In laying of the Central Thread to find the Geocentrick Place by the Inſtrument, be ſure to lay its End oppoſite to the End of the Thread that comes from the Planet: As in the Example above, ☉ ⊖ repreſents the Earth's *Index*; ☉ ♀ the *Index* for *Venus*; and ♀ ⊖ is the Thread (in the Inſtrument) laid from ♀ to the Interſection of the Earth's *Index* with its Orbit; and ☉ *a* is the Central Thread laid parallel to ♀ ⊖: Becauſe the Parallaxes of the Earth's Orb in ☿ and ♀ are often very large, there will ariſe a Difficulty in laying of the Threads parallel; for which uſe a parallel Ruler.

To find the Station of Venus *a* S. S. *to Retrogradation.*

Equ. Time.	Long. ☉. S. ° ′ ″	Anom. ☉. S. ° ′ ″	
1726.	9 20 39 19	6 12 47 22	
Mar. 3.	2 1 6 36	2 1 6 36	
	11 21 45 55	8 13 53 48	
Add	1 53 45		
☉ in	11 23 39 40	499801	Node ♀.
			S. ° ′
1726.	1 29 18	3 27 14	2 14 36
Mar. 3.	3 9 20	3 9 20	5 9 22
		7 6 34	2 24 46
	5 8 38		
Equat. add	24		*Inclination*
			3 22
♀ *Helioc.*	5 9 02	♀ à ☉ 4.85692	N. A.
☉*'s Place.*	11 23 40	☉ à ⊖ 4.99901	
		° ′	
Commut.	5 15 22	t. 35 51 9.85891	
Half	2 22 41	t. 45 00 add	
Elong. add	1 1 15	c t 80 51 9.207013	
♀ *Geocent.*	0 24 55	t 82 41 10.891440	
	Direct	t 51 26 10.098453	
		31 15 Elong. *add*	
		134 7 Paral. *ſub.*	
Lat. ſ.	14 38 c.A 0.597511	*Sub. the Parallax 4 S. 14° 7′ from the Heliocentr. Place, and it gives the Geocentrick Place.*	
Lat. ſ.	31 15 9.714977		
Lat. t.	3 22 8.769578		
Lat. t.	6 54 9.082066		

To find the Station of Venus *à* S, S. *to Retrogradation.*

	Long. ⊙.				Anom. ⊙.						
Equ. Time.	S.	°	′	″	S.	°	′	″			
1726.	9	20	39	19	6	12	47	22			
Mar. 4.	2	2	5	44	2	2	5	33			
	11	22	45	03	8	14	52	55			
Equat. add		1	54	15		499813					
									Node ♀.		
⊙ in	11	24	39	18					S.	°	′
1726.	1	29	18		3	27	14		2	14	36
Mar. 4.	3	10	57		3	10	57		5	10	40
	5	10	15		7	8	11		2	26	4
Equat. add			25						*Inclination.*		
♀ *Helioc.*	5	10	40		♀ à ⊙			4.85696	3	22	*N.A.*
⊙*'s Place.*	11	24	39		⊙ à ⊖			4.99813			
						°	′				
Commut.	5	16	1		t.	35	51	9.85883			
Half	2	23	0		t.	45	00	add			
Elong. add	1	00	19		c.t.	80	51	9.207013			
♀ *Geocent.*	0	24	58		t.	83	00	10.910856			
		Direct.									
Lat. ſ.	13	59′	*C.A.*	0.616832	t.	52	41	10.117869			
Lat. ſ.	30	19		9.703101		30	19	Elong. *add*			
Lat. t.	3	22		8.769578		135	41	Parall. *ſub.*			
Lat. t.	7	00		9.089511							

To find the Station of Venus à S. S. *to Retrogradation.*

	Long. ⊙.	Anom. ⊙.	
Equ. Time.	S. ° ′ ″	S. ° ′ ″	
1726.	9 20 39 19	6 12 47 22	
Mar. 5.	2 3 4 53	2 3 4 42	
	11 23 44 12	8 15 52 04	
Equat. add	1 54 41		
Sun *in*	11 25 38 53	4.99826	Node ♀.
			S. ° ″
1726.	1 29 18	3 27 14	2 14 36
Mar. 5.	3 12 33	3 12 33	5 12 17
	5 11 51	7 09 47	2 27 41
Equat. add	26		*Inclination.*
♀ *Helioc.*	5 12 17	♀ à ⊙ 4.85701	3 23
⊙'s *Place.*	11 25 39	⊙ à ⊖ 4.99826	
Commut.	5 16 38	t. 35° 51′ 9.85875	
Half	2 23 19	t. 45 00 *Add.*	
Elong. add	29 21	ct 80 51 9.207013	
♀ *Geocent.*	0 25 00 Direct.	t. 83 19 10.931153	
Lat. ſ.	13° 22′ *C.A.* 0.636046	t. 53 58 10.138166	
ſ.	29 21 9.690323	29 21 *Elong. add*	
t.	3 23 8.771727	137 17 *Paral. ſub.*	
t.	7 9 9.098096	*ferè.*	

To

To find the Station of Venus *à* S. S. *to Retrogradation.*

	Long. ☉.	Anom. ☉.	
Equ. Time.	S. ° ′ ″	S. ° ′ ″	
1726.	9 20 39 19	6 12 47 22	
Mar. 6.	2 4 4 1	2 4 3 50	
	11 24 43 20	8 16 51 12	
Equat. add	1 55 7		
☉ in	11 26 38 27	4.99840	Node ♀.
			S. ° ′
1726.	1 29 18	3 27 14	2 14 36
Mar. 6.	3 14 9	3 14 9	5 13 54
	5 13 27	7 11 23	2 29 18
Equat. add	27		
			Inclination
♀ *Helioc.*	5 13 54	♀ à ☉ 4.85705	3 23
☉'*s Place.*	11 26 38	☉ à ⊖ 4.99840	N. A.
		° ′	
Commut.	5 17 16	t. 35 50 9.85865	
Half	2 23 38	t. 45 00 add	
Elong. add	28 18	ct 80 50 9.207817	
♀ *Geocent.*	0 24 56 *Retrog.*	t 83 38 10.952418	
		t 55 20 10.160235	
		28 18 Elong. *add*	
	° ′	138 58 Paral. *ſub.*	
Lat. ſ.	12 44 C.A 0.656771		
ſ.	28 18 9.675859		
t.	3 23 8.771727		
t.	7 14 9.104357	N. A.	

To find the Station of Venus *to Direction* à S. S.

	Long. ☉.	Anom. ⊖.	
Equ. Time.	S. ° ′ ″	S. ° ′ ″	
Ep. 1726.	9 20 39 19	6 12 47 22	
Apr. 15.	3 13 29 35	3 13 29 18	
	1 4 8 54	9 26 16 40	
Equ. add	1 44 35		
Sun *in*	1 5 53 34	500356	Node ♀.
			S. ° ′
1726.	1 29 18	3 27 14	2 14 36
Apr. 15.	5 18 14	5 18 14	7 18 11
	7 17 32 0	9 15 28	5 3 35
Equ. add	39 3		Arg. Lat.
♀ *Helioc.*	7 18 11 3	Logar. ♀ à ☉	4.86002
Sun's*Place*	1 5 53 29	Logar. ☉ à ⊖	5.00356
Commut.	6 12 17 34	t. 35 41 5	9.85646
Half	3 6 8 47	*Ad.* 45 00 0	
Complem.	2 23 51 13	c.t. 80 41 5	9.214923
Elong. ſub.	27 8 21	t. 83 51 13	10.967832
♀ *Geocent.*	0 8 45 8	t. 56 42 52	10.182755
		27 8 21	*Elong. ſub.*
° ′ ″			
ſ. 12 17 34	C. A. 0.671809	140 34 5	*Parall. add*
ſ. 27 8 21	9.659110		
t. 1 30 11	8.418984		
t. 3 13 3 N. D.	8.749867		

Or, add the Parallax to the Heliocentrick Place, gives the Geocentrick Longitude.

To find the Station of Venus *to Direction* à S. S.

	S. ° ′ ″	S. ° ′ ″	
1726.	9 20 39 19	6 12 47 22	
April 16.	3 14 28 43	3 14 28 25	
	1 05 08 02	9 27 15 47	
Equat. add	1 43 40		
Sun *in*	1 6 51 42	5.00368	S. ° ′ ″
1526.	1 29 18	3 27 14	2 14 36 00
April 16.	5 19 50	5 19 50	7 19 46 47
	7 19 08	9 17 04	5 5 10 47
Equat. add	38 47		Arg. Lat.
♀ *Helioc.*	7 19 46 47	Logar. ♀ à ☉	4.86012
Sun's*Place*	1 6 51 42	Logar. ☉ à ⊖	5.00368
Commut.	6 12 55 5	t. 35 41 53	9.85644
Half.	3 6 27 32	*Add*45 00 00	
Complem.	2 23 32 28	c.t. 80 41 53	9.214290
Elon. ſubt.	28 11 33	t. 83 32 28	10.946120
♀ *Geocen.*	0 8 40 9	t. 55 20 55	10.160410
° ′ ′		28 11 33	*Elongation.*
ſ.12 55 5	*C. A.* 0.650611	138 53 23	*Parallax add*
ſ.28 11 33	9.674342		
t. 1 25 6	8.393740		
t. 2 59 43 N. D.	8.718693		

Or, add the Parallax to the Heliocentrick Place, gives the Geocentrick Longitude.

To find the Station of Venus *to Direction à* S. S.

	Long. ☉.	Anom. ☉.	
Equ. Time.	S. ° ′ ″	S. ° ′ ″	
Ep. 1726.	9 20 39 19	6 12 47 22	
Apr. 17.	3 15 27 52	3 15 27 34	
	1 6 7 11	9 28 14 56	
Equat. add	1 42 41		
Sun *in*	1 7 49 52	500379	Node ♀.
			S. ° ′ ″
1726.	1 29 18	3 27 14	2 14 36 00
Apr. 17.	5 21 26	5 21 26	7 21 22 27
	7 20 44	9 18 40	5 6 46 27
Equ. add	38 27		Arg. Lat.
♀ *Helioc.*	7 21 22 27	Logar. ♀ à ☉	4.86022
Sun's *Place*	1 7 49 52	Logar. ☉ à ⊕	5.00379
Commut.	6 13 32 35	t. 35 41 51	9.85643
Half	3 6 46 17	*Ad.* 45 00 0	
Complem.	2 23 13 43	c.t. 80 41 51	9.214317
Elong. ſub.	29 9 58	t. 83 13 43	10.925417
♀ *Geocent.*	0 8 39 54	t. 54 3 45	10.139734
	Retrograde.	29 9 58	*Elong. ſub.*
° ′ ″			
ſ. 13 32 35	C. A. 0.630458	137 17 28	*Parall. add*
ſ. 29 9 58	9.687834		
t. 1 20 0	8.366895	Here, the Parallax added to the Heliocentrick Place, gives the Geocentrick Longitude.	
t. 2 46 23	8.685187		
N. D.			

To find the Station of Venus *to Direction* à S. S.

Equ. Time.	Long. ⊙. S. ° ′ ″	Anom. ⊙. S. ° ′ ″	
1726.	9 20 39 19	6 12 47 22	
April 18.	3 16 27 00	3 16 26 42	
	1 07 06 19	9 29 14 04	
Equat. add	1 41 43		
Sun *in*	1 8 48 2	5.00391	
			S. ° ′ ″
1526.	1 29 18	3 27 14	2 14 36 00
April 18.	5 23 2	5 23 2	7 22 58 5
	7 22 20 0	9 20 16 0	5 8 22 5
Equat. add	38 5		Arg. Lat.
♀ *Helioc.*	7 22 58 5	Logar. ♀ à ⊙	4.86033
Sun's *Place*	1 8 48 2	Logar. ⊙ à ⊖	5.00391
Commut.	6 14 10 3	t. 35 41 45	9.85642
Half.	3 7 5 1	*Add* 45 00 00	
Complem.	2 22 54 59	c.t. 80 41 45	9.214396
Elon. ſubt.	1 00 5 49	t. 82 54 59	10.905646
♀ *Geocen.*	0 8 42 13	t. 52 49 10	10.120042
° ′ ″	Direct.	30 5 49	*Elongat. ſub.*
ſ. 14 10 3	*C. A.* 0.611264	135 44 9	*Parallax add*
ſ. 30 5 45	9.700225		
t. 1 14 46	8.337495		
t. 2 33 6 N. D.	8.648984		

Add the Parallax to the Heliocentrick Place, gives the Geocentrick Longitude.

To find the Station of Venus *to Direction* à A. C.

	Anom. ☉.				Præceſ. Equ.				Equation.		
	S.	°	′	″	S.	°	′	″	′	″	
1721.	6	13	19	22	0	29	12	0	60	0	L.L. 0
5	11	29	43	28			4	0	59	3	69
Apr. 15.	2	28	42	18				12	32	11	2705
	0	14	47	3				2	31	40	2774
Sun *Anom.*	9	26	32	11	0	29	16	14			
					0	6	6	1			5.003450
							31	40			
Sun *in*					1	5	53	55			
1726.	3	24	57	42	Logar. ♀ à ☉				*Sub.*		4859915
Apr. 15.	5	18	13	25	Logar. ☉ à ⊕				à		5.003450
♀ *Anom.*	9	13	11	07	t.	54	18	1			10.143535
					Sub.	45	00	00			
♀ à 1 ✱ ♈	6	18	50	12							
Præ. Equ.	0	29	16	14	t.	9	18	1			9.214211
Equat. add			11	4	t.	83	48	13			10.964286
♀ *Helioc.*	7	18	17	30	t.	56	27	23			10.178497
Sun's*Place*	1	5	53	55		27	20	50	*Elongat. ſub.*		
Commut.	6	12	23	35		140	15	36	*Parallax add*		
Half	3	6	11	47							
Complem.	2	23	48	13		°	′	″			
					ſ.	12	23	35	C.A.		0.668671
Elon. ſub.		27	20	50	ſ.	27	20	50			9.662173
					t.	1	30	18			8.419508
♀ *Geocen.*	0	8	33	5	t.	3	13	16			8.750352
	Retrograde.				N. D.						

To find the Station of Venus to Direction à A. C.

	Anom. ☉.				Præceſſ. Equ.				*Propor. Part.*		
Equ. Time.	S.	°	'	"	S.	°	'	"	'	"	
1721.	6	13	19	22	0	29	12	0	60	0	L.L. 0
5	11	29	43	28	0	0	4	0	59	0	73
April	2	28	42	18				12	31	19	2824
16	0	15	46	11				2	30	5	2897
Sun *Anom.*	9	27	31	19	0	29	16	14			
					0	7	5	4			
							30	5			5.003562
Sun *in*					1	6	51	23			
1726.	3	24	57	42	Logar. ♀ à ☉						4.860015
April 16.	5	19	49	33	Logar. ☉ à ⊖						5.003562
						°	'	"			
♀ *Anom.*	9	14	47	15	t.	54	18	4			10.143547
♀ à 1 ✳ ♈	6	19	49	56	*Sub.*	45	00	00			
Præ. Equ.	0	29	16	14	t.	9	18	4			9.214251
Equat. add			47	1	t.	83	29	6			10.942331
♀ *Helioc.*	7	19	53	11	t.	55	06	43			10.156582
Sun's*Place*	1	6	51	23		28	22	23	*Elongat. ſub.*		
Commut.	6	13	01	48		139	01	49	*Parallax add*		
Half.	3	6	30	54							
Complem.	2	23	29	6							
						°	'	"			
Elon. ſubt.		28	22	23	f.	13	1	48			0.646928
					ſ.	28	22	23			9.676886
	0	8	29	00	t.	1	25	10			8.394081
♀ *Geocen.*	Retrograde.				t.	2	59	23			8.717895
					N. D.						

To find the Station of Venus *to Direction* à A. C.

	Anom. ⊙.				Præceſ. Equ.				Equation.			
Equ. Time.	S.	°	'	"	S.	°	'	"	'	"		
1721.	6	13	19	22	0	29	12	0	60	0	L.L.	0
5	11	29	43	28			4	0	59	0		73
Apr.	2	28	42	18				12	30	27		2946
Day 17.	0	16	45	19				2	29	56		3019
Sun *Anom.*	9	28	30	27	0	29	16	14				
☉ à 1 * ♈					0	8	4	4				
Prop. Part	*Add*						29	56				5.003675
Sun *in*					1	7	50	14				
1726.	3	24	57	42	Logar. ♀ à ☉				*Sub.*			4.860115
Apr. 17.	5	21	25	40	Logar. ☉ à ⊕				à			5.003675
						°	'	"				
♀ *Anom.*	9	16	23	22	t.	54	18	7				10.143560
♀ à 1 * ♈	6	21	49	19	*Sub.*	45	00	00				
Præ. Equ.	0	29	16	14	t.	9	18	7				9.214290
Equat. add			23	14	t.	83	10	44				10.922209
♀ *Helioc.*	7	21	28	47	t.	53	51	34				10.136499
Sun's *Place*	1	7	50	14		29	19	10	*Elongat. ſub.*			
Commut.	6	13	38	33		137	02	18	*Parallax add*			
Half	3	6	49	16								
Complem.	2	23	10	44	ſ.	13	38	33	C.A.			0.627339
Elon. ſub.		29	19	10	ſ.	29	19	10				9.689910
					t.	1	19	53				8.366804
♀ *Geocen.*	0	8	31	4	t.	2	45	57				8.684053
	Direct.				N. D.							

To find the Station of Venus *to Direction* à A. C.

	Anom. ☉.				Præ. Equ.				Equation.		
Equ. Time.	S.	°	′	″	S.	°	′	″	′	″	
1721.	6	13	19	22	0	29	12	0	60	0	L.L. 0
5	11	29	43	28			4	0	58	57	77
April	2	28	42	18				12	29	36	3069
Day 18.	0	17	44	28				2	29	5	3146
Sun *Anom.*	9	29	29	36	0	29	16	14			
⊙ à 1 * ♈					0	9	3	4			
Prop. Part	*Add*						29	5			5.003784
Sun *in*					1	8	48	23			
1726.	3	24	57	42	Logar. ♀ à Sun						4.860212
April 18.	5	23	1	48	Logar. Sun à ⊖						5003784
						°	′	″			
♀ Anom.	9	17	59	30	t.	54	18	9			10.143572
♀ à 1 * ♈	6	22	49	0		45	0	0			
Præ. Equ.	0	29	16	14	t.	9	18	9			9.214317
Equat. add			59	11	t.	82	51	59			10.902561
♀ *Helioc.*	5	23	4	25	t.	52	37	6			10.116878
☉'s *Place.*	1	8	48	23							
						30	14	53	*Elongation.*		
Commut.	6	14	16	2							
Half	3	7	8	1		135	29	5	*Parallax.*		
Complem.	2	22	51	59							
Elong. ſub.	1	0	14	53		°	′	″			
					ſ.	14	16	2			0.608281
♀ *Geocent.*	0	8	33	30	ſ.	30	14	53			9.702211
	Direct.				t.	1	14	43			8.337204
					t.	2	32	38			8.647696

A Table *of the Periods of* Venus's *Retrogradation when in Conjunction with the* Sun, *at the Aſcending Node in the Month of* November.

Periods.	Time add or ſubtr.					Latitude.		
Years.	D.	H.	′	″		′	″	
8	2	10	52	30	Sub.	24	41	South.
235	2	10	09	00	Add.	11	33	North.
243	0	0	43	00	Sub.	13	8	South.
478	But in Leap-Year for the laſt Period, thus,							
		23	17		Add.			

Angle of the viſible Way 9° 5′
Semidiameter Sun 16 21″
And the greateſt Duration of the Tranſit of ♀ 7 H. 56′

A TABLE *of the Periods of* Venus's *Retrogradation when in Conjunction with the* Sun, *at the Deſcending Node in the Month of* May.

Periods.					Latitude.		
Years.	D.	H.	′		′	′	
8	2	6	58	Sub.	19	58	North.
235	2	8	18	Add.	9	21	North.
243	0	1	23	Add.	10	37	North.
478	And in Leap-Year add or ſubt. one Day more.						

Sun's Semidiameter 15′ 5″
Angle of the viſible Way 8° 28′
The greateſt Duration, as before 7 56

Note, The Latitude of *Venus* at the given time, is to be increas'd at the End of the Period, either North or South, ſo much as is here ſet down. And by this Method yeu may eaſily gain the Time and Latitude that *Venus* will have when ſeen in the Sun's Disk: To which mean Time, if you find the Sun's true Place, you will have the Longitude of the Sun and *Venus*, as ſeen from the Earth, Retrograde; Which will be of good uſe to the Young Aſtronomer, till he is acquainted with the perfect Method; and which I ſhew in another Place.

And the Radix let be that of Mr. *Horrox*, 1639, *November* 24 D. 6 H. 37′ P.M. Lat. 8′ 30″ South.

Eaample. According to the firſt Period, I would know if *Venus* will be ſeen in the Sun in the Month of *November*?

OPERATION.

	′	″			Y.		D.	H.	′	″
Radix	8	30	South.		1639		24	6	37	0
Period	24	41	South.	add	8	ſub.	2	10	52	30
Lat.	32	11	South		1647		21	19	44	30

By this it appears, that *Venus* will paſs below the Sun without the Disk; becauſe the Latitude exceeds the Sun's Semidiameter 16′ 21″. At the time above-mention'd the Sun's true Place is ♐ 10° 4′ 42″, *Veuus*'s Place ♐ 10° 29′ 26″, with 39′ Latitude South.

By the ſecond Period,

		D.	H.	′	″		′	″	
Radix	1639	24	6	37	00	ſub.	8	30	South
Period	235	2	10	9		add	11	33	North.
♀ in ☉	1874	26	16	46			3	3	in *November.*

Radix at the Deſcending Node in the Month of *May.*
Let be 1526 : 23 D. : 9 H. : 37′ Lat. 5′ 6″ North.

By the foregoing Calculations from Aſtronomical Tables I have ſhewn, between what two Days at Noon *Venus* is Stationary, both to Retrogradation, and again to Direction.

For ſince all the Planets do ſometimes appear to move forwards, and afterwards to return backwards; between the progreſſive Motion, and the regreſſive, there will be ſome Point, where it will appear to ſtand, and not to move at all in the Heavens. And this is when the Angle at the Planet doth not change for ſome ſmall ſpace of time: For then the Line joyning the Earth and Planet keeps parallel to it ſelf. And the Planet therefore appears Stationary, when the momentanous Change of the Angle at the Earth, is to the momentanous Change of the Angle at the Planet; that is, As the Change of the Elongation, To the Change of the Earth's Orbit: So is the Periodical time of the Planet, to the Periodical time of the Earth.

Some time between the 5th and 6th Days of *March* 1726, *Venus* is Stationary to Retrogradation: And to find out the true time, is a Problem of very great Difficulty: But for a common Method, you may ſay, As the Difference of the Angles at the Planet, on the two Days at Noon before and after the Station of the Planet, is to 24 Hours: So is the Difference of the Angles at the Earth, to the time of the Planet's Station. To which time compute the Place of the Planet; and ſo by Approximation you may find out the Time and Place in the Heavens.

Example. *Anno* 1726, *Mar.* 5, *Venus* is Stationary to R.

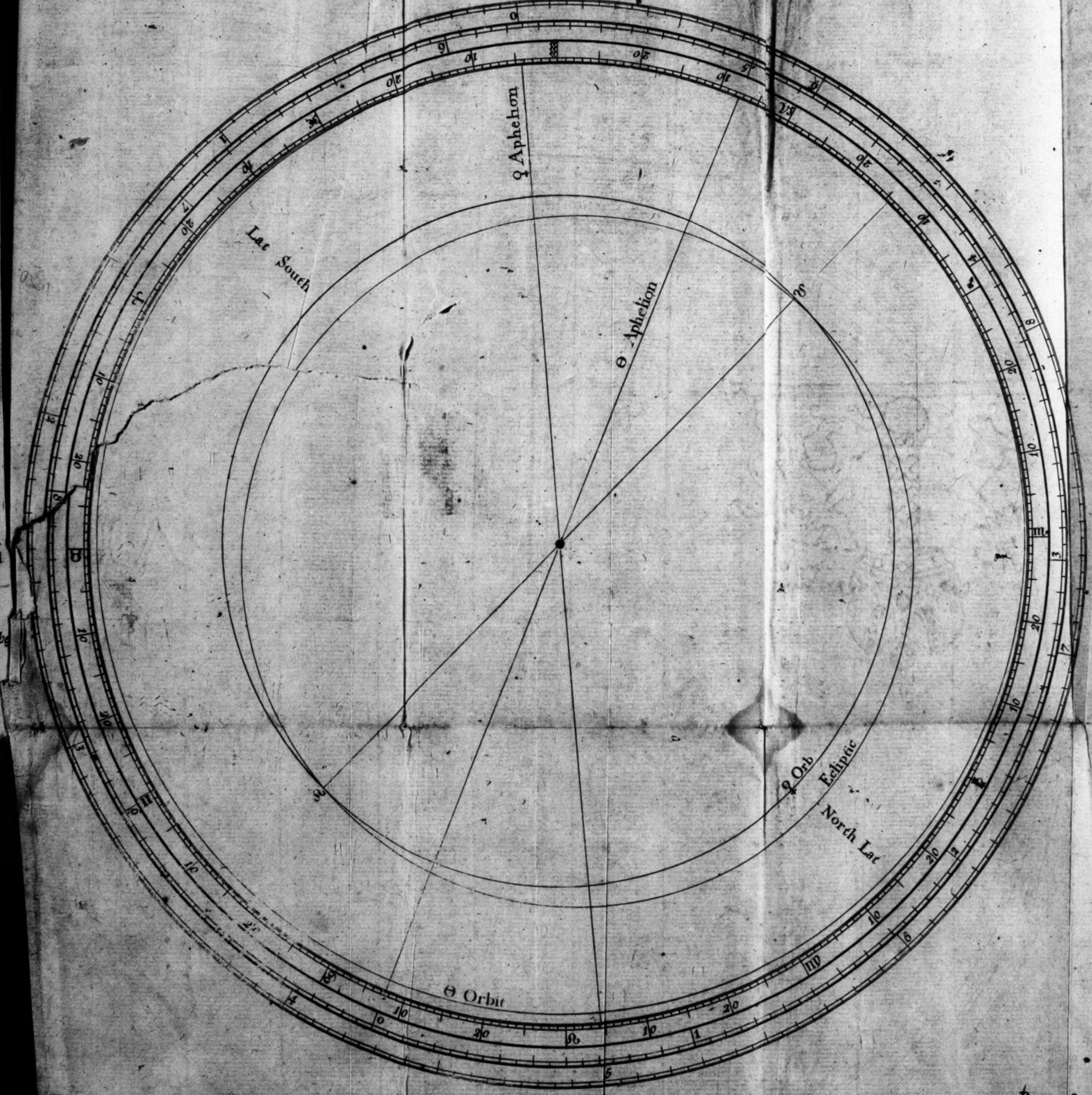
		°	'		
The	5 Day at Noon	29	21	137	17
	6 Day at Noon	28	18	138	58
	Difference	1	3	1	41

Now ſay, As 1° 41': 24 :: 1° 3': 14 H. 58'.

To this Time compute again the Place of the Earth and Planet, and by the Inſtrument you may perceive, the Parallel Thread will not move at all.

The

Venus



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The Theory of MERCURY.

MERCURY is alſo call'd an Inferiour Planet, becauſe his Orb is circumſcrib'd by the Earth's Orb; and by reaſon of his Vicinity to the Sun, is the ſeldomeſt ſeen of all the Primary Planets. He is rarely ſeen with the naked Eye, becauſe his Orb lies next to the Sun *. This Planet is never found diſtant from the Sun, either before or after him, more than 28 Degrees: And every thirteen Years you may nearly find him in the ſame Place of the Heavens. He reſpects the Sun as his Center, and makes one Revolution round the ſame in his Orbit in 87 Days, 23 Hours, 15 Min. 53 Sec. His Heliocentrick mean Diurnal Motion is 4 Degrees, 5 Minutes, 32 Seconds; according to which, there will be 115 Days between one Mean Conjunction with the Sun and another of the ſame kind; and if this Conjunction was in *Piſces*, the next of the ſame kind will be in *Cancer*, that is, 4 Signs further advanc'd.

The true Diſtance of each Conjunction of *Mercury* with the Sun, cannot be brought to any ſtanding Number, becauſe of his great Eccentricity, and Smallneſs of his Orb: For when he paſſes by his Apheliál Point, there will be more Days, and going by his Perihelion, a leſs Number of Days; but by the Inſtrument it may be found at all times exactly. When *Mercury* is in Conjunction with the Sun in the lower Part of his Orbit, and if his Latitude at the Earth be then leſs than the Sun's apparent Semidiameter, he may be ſeen with a good Teleſcope to make a black Spot on the Sun's Disk.

I have now by me all the Work of the Tranſits of *Venus* and *Mercury* over the Sun's Disk for this preſent Century, a Work both Curious and Laborious. *Mercury* is both Direct, Stationary and Retrograde to us at the Earth; but makes no Aſpects with the Sun, ſave the Conjunction. When *Mercury* is in Conjunction with the Sun in the upper Part of his Orb, he is always Direct in Motion, and paſſes behind the Sun, if his Latitude correſpond; but in the lower, Retrograde: And in

* *In the* ☉*'s Eclipſe* 1715, Ap. 22. *at* 9M. *I ſaw him.*

the latter Caſe is nearer the Earth than in the former, by the Semidiameter of his Orb ; as is plain by the Inſtrument.

		°	′	″
The Year 1725, his Aphelion was in	♐	12	53	0
Aſcending Node in	♉	15	47	0
Its Annual Motion			1	36
Inclination of the Orbit		6	54	0
Eccentricity				7970
Aphelial Diſtance				46608
Mean				38710
Perihelion Diſtance				30688

Apogeon Diſtance	24387	Semidiameters of the Earth.
Perigeon Diſtance	9534	

			″	‴
His	Leaſt	Horizontal Parallax is	10	12
	Mean		13	59
	Greateſt		27	6

His Colour is ſomething reſembling that of *Mars*. He is obſerv'd to turn once round upon his Axis in Six Hours, and he is twenty ſeven times leſſer than our Earth ; his Semidiameter is 242 of ſuch Parts as the Earth's Semidiameter is 727. This Planet becomes Retrograde three or four times every Year, and as often conjoyn'd with the Sun : One Conjunction is made when Oriental and Direct ; and the next, when Occident and Retrograde : And (not only in *Mercury*, but in the other Four Primary Planets) if the Elongation be leſs than the Commutation, then will the Geocentrick Latitude be leſs than the Heliocentrick ; but if the Commutation be more, then the contrary.

By the Motion of theſe Two Inferiour Planets, we are very well aſſur'd of the Earth's Motion : For if their Orbs circumſcrib'd the Earth's Orb, then once in every Revolution the Earth would interpoſe between them and the Sun : But ſuch a Phænomenon has never been obſerv'd.

The following Table will very well inform the Reader, how many Days and Degrees *Mercury* goes back in each Sign; and alſo the Days between each Retrogradation; and that the Angle at the Sun is always different, when he is Stationary: For *Anno* 1720, *Dec.* 6, it was 4 S. 11° 7′; but *Anno* 1726, *Apr.* 28, it was 5 S. 8° 21′. So that no ſtanding Rule can be given in this, but only by a particular Calculation.

Mercury does always keep ſo near the Sun, with ſo great a ſhining Luſtre in all his Parts; and the Heavens, while he is ſeen, are ſo much illuminated, that there can be no Obſervations made to diſcover his Spots, by which his Rotation might be certainly determin'd: For as yet it is a Doubt whether he turns upon his Axis, or not.

⁂

The time when ☿ becomes Retrograde.		☿ Longitude.			☿ Latitude.				Time between one Retrograd and another.	Days Retrog.	Degrees Retrograde		Sun's Place.		
			°	′	°	′			Days.		°	′	°		′
1716 *Feb.* 28,	R. Occid.	♈	4	56	3	20	N	A	125	23	12	45	20	♓	7
1716 *July* 2,	R. Occid.	♌	10	48	2	52	S	A	115	24	11	13	20	♋	59
1716 *Oct.* 25,	R. Occid.	♐	2	8	2	12	S	D	108	20	16	11	13	♏	11
1717 *Feb.* 10,	R. Occid.	♓	17	51	2	44	N	A	125	23	14	11	2	♓	55
1717 *June* 15,	R. Occid.	♋	21	7	2	22	N	A	116	22	9	56	4	♋	33
1717 *Octob.* 9,	R. Occid.	♏	16	18	1	16	S	D	108	20	16	0	26	♎	52
1718 *Jan* 25,	R. Occid.	♓	1	18	2	10	N	A	121	22	15	3	16	♒	28
1718 *May* 26,	R. Occid.	♋	1	43	0	42	S	A	119	24	8	55	15	♊	15
1718 *Sep.* 22,	R. Occid.	♏	0	14	3	25	S	D	108	21	15	43	9	♎	8
1719 *Jan.* 8,	R. Occid.	♒	15	2	0	5	N	A	119	22	15	40	28	♑	7
1719 *May* 7,	R. Occid.	♊	11	31	0	44	N	D	121	23	8	26	26	♉	49
1719 *Sept.* 5,	R. Occid.	♎	13	55	3	41	S	A	109	22	15	13	22	♍	52
1719 *Dec.* 23,	R. Occid.	♑	28	58	0	29	N	A	115	21	15	0	12	♑	24
1720 *Apr.* 16,	R. Occid.	♉	21	45	1	51	N	D	124	25	9	0	7	♉	18
1720 *Aug.* 18,	R. Occid.	♍	27	1	4	3	S	A	110	23	14	0	6	♍	7
1720 *Dec.* 6,	R. Occid.	♑	12	50	0	24	S	D	112	21	16	0	25	♐	47
1721 *Mar.* 28,	R. Occid.	♉	3	2	2	39	N	D	125	24	10	27	18	♈	32
1721 *July* 31,	R. Occid.	♍	9	47	3	50	S	A	112	23	13	26	18	♌	34
1721 *Nov.* 20,	R. Occid.	♐	27	9	0	38	S	D	110	20	16	22	9	♐	18
1722 *Mar.* 10.	R. Occid.	♈	15	0	3	15	N	A	126	24	11	48	0	♈	34
1722 *July* 14,	R. Occid.	♌	21	42	3	48	S	A	113	24	12	1	2	♌	2
1722 *Nov.* 4,	R. Occid.	♐	11	23	1	49	S	D	109	20	16	17	22	♏	51
1723 *Feb.* 21,	R. Occid.	♓	27	42	3	5	N	A	124	23	13	18	13	♓	24
1723 *June* 25,	R. Occid.	♌	2	48	2	41	S	A	115	24	10	38	13	♋	41
1723 *Oct.* 18,	R. Occid.	♏	25	31	2	41	S	D	109	20	16	9	5	♏	31
1724 *Feb.* 4,	R. Occid.	♓	10	52	2	29	N	A	123	22	14	34	26	♒	5
1724 *June* 6,	R. Occid.	♋	13	14	1	41	S	A	116	24	9	19	26	♊	18
1724 *Oct.* 1,	R. Occid.	♏	9	39	3	12	S	D	108	22	15	54	19	♎	19
1725 *Jan.* 17,	R. Occid	♒	24	27	1	39	N	A	120	22	15	30	8	♒	38
1725 *May* 17,	R. Occid.	♊	23	13	0	2	N	D	120	24	8	32	6	♊	57
1725 *Sept.* 14,	R. Occid.	♎	23	29	3	35	S	A	109	21	15	30	2	♎	17
1726 *Jan.* 2.	R. Occid.	♒	8	1	1	11	N	A	116	20	14	0	23	♑	8
1726 *Apr.* 28,	R. Occid.	♊	2	57	1	29	N	D	123	24	9	0	18	♉	28
1726 *Aug* 28,	R. Occid.	♎	7	1	3	58	S	A	122	22	14	58	15	♍	26
1726 *Dec.* 17.	R. Occid.	♑	22	11	0	26	N	A	111	20	16	11	6	♑	35

The foregoing Table may be examin'd by the Inſtrument, as I ſhall ſhew in finding his Place *December* the *26th* at Noon, *Anno* 1725.

The Work ſtands thus:

	W.D.	Anom. ⊖.	Anom. ☿.
Radix 1725,	4	369	3262
December	6	9144	7967
Day 26	5	712	2956
Sum	1	225	4185

The Day of the Week is the Firſt, or *Sunday*, and the Indexes laid to their reſpective Anomalies, gives the Earth's Place ♋ 16°, and the Heliocentrick Place of ☿, ♈ 29° 5′: The Indexes thus reſting, the Thread laid from ☿ to the Interſection of the Earth's Index, with its Orbit, there is this Triangle form'd, [See Fig. 12.] in which,

The Angle	⊖ ⊙ ☿	76°	54′	Commut. or Angle at the Sun,
	⊙ ⊖ ☿	19	4	Elongat. add to Sun's Place,
	⊙ ☿ ⊖	84	2	Parallax of the Orb, ſubtract
Sum		180	0	

the Heliocentrick Place of *Mercury*, gives the Geocentrick Place in Longitude ♒ 5°: And the Thread ⊖ *a*, being laid parallel to the Thread ☿ ⊖, gives the ſame Longitude, with Latitude 38′ *S.* deſcending: Direct in Motion, becauſe the Angle at the Sun is more than the Limits of the Retrogradation, which in the next Stationary Poſition (which will fall on *Jan.* 2, following) will be 40° 55′.

1. To know when any of the Five Primary Planets are in Aphelion, or Perihelion.

From theſe Tables collect the Anomaly of the Planet for the time propos'd; and if the Sum amount to 0, it is in its Aphelion; but if the Sum be 5000, then it is in its Perihelion.

2. To know when they are in Apogeon, or Perigeon.

In the Three Superiours *Saturn*, *Jupiter* and *Mars*, if the two Indexes lie in a ſtreight Line, one cutting one Side, and the other Index the other Side of the Inſtrument, then that Planet is in Conjunction with the Sun, and in Apogeon, and always Retrograde. In the Two Inferiours *Venus* and *Mercury*, whether the two Indexes be extended, or lye one upon the other in a ſtreight Line, the Planet is then in Conjunction with the Sun; if in the firſt Poſition of the Indexes, the Planet is in Apogeon; if in the ſecond, in Perigeon.

3. To know when a Planet is at its greateſt Elongation or Digreſſion from the Sun.

In the Three Superiours, this is always when they are diametrically Oppoſite to the Sun, = 180°: But in *Venus* and *Mercury*, it is when the Thread laid from the Planet to the Earth, cuts its Index at a Right Angle; that is, ſtands ſo with the Planets Index: For then their Geocentrick Motions are equal to the Sun's apparent Motion, or Earth's true Motion.

4. To find when a Planet is Direct, Stationary and Retrograde.

Becauſe the Retrogradations of the Planets are not real in themſelves, but only appear ſo to us at the Earth, cauſ'd by the Earth's Motion: Therefore by reaſon of the various Poſitions of the Earth at different times, there cannot be any certain univerſal and perpetual Rule given, when to know this, and when not, by Numbers; yet becauſe the following Table will be ſerviceable herein, I ſhall inſert it, which coſt me no ſmall Pains, to bring to bear ſo near as it does: But the Inſtrument will ſhew at all times, and in all Poſitions of the Earth, the Retrogradations of all the Primary Planets, to perfection.

A TABLE of the Stations of the Planets.

PLANETS.	*Angle at the ☉ when Stationary to Retrograd.*	*Days Retrograde.*	*Angle at the ☉ when Stationary to Direction.*	*Degrees Retrograde.*	*Elongat. à ☉ when begin. to be Retrog.*	*Greatest Dist. à ☉ in Opposit.*	*Elongat. à ☉ when beginn. to be Direct.*	*Ang. at ☉ of ♄ ♃ ♂ when in ☍ to the Sun.*	*Ang. at ☉ of ♄ ♃ ♂ when in ☌ with the Sun.*
♄	66	140	66	7	108	° 180	108	° 180	° 0
♃	53 30	120	53 30	10	116	180	116	180	0
♂	22 30	80	22 30	♋ 20 ♉ 15 ♓ ♒ 10	135	180	135	180	0
♀	15	44	15	18	28	48	28	180° ☌ ☉ when Retrog.	0° ☌ ☉ when Direct.
☿	32	24	32	° ′ ♑ 16 ♊ 8 32	22	28	22	180° ☌ ☉ when Retrograde.	0° ☌ ☉ when Direct.

The Title of each Column is a ſufficient Explanation. However, obſerve, that if in working for *Saturn*'s Place, if the two Indexes make an Angle leſs than 66 Degr. you may then conclude, he is Retrograde, and continues ſo about 140 Days, goes 7 Degr. back; his Elongation when Stationary, is 108 Degr. either way; and his greateſt Diſtance from the Sun when in Oppoſition, is 180 Degr. but in Conjunction this Angle is nothing.

The Angle at the Sun is always known by the two Indexes cutting the Degrees in the Circle of Signs.

By the Tables of the Stations of the Planets it may be obſerv'd, that *Mercury* in *Capricorn* goes back 16 Degrees; but in *Gemini*, only 8 Degr. 32 Min. and that the firſt he performs in 20 Days, and the latter in 24 Days, as may be ſeen by the Table in Page 69. The like of the other Planets is to be obſerv'd.

Note, The Table above is general; but to know what is more particular herein, ſee the Tables of each Planet at large in their proper Places, where I have made all plain.

* * *

A TABLE *of the Periods of* Mercury's *Retrogradation, in Conjunction with the* Sun *at the Aſcending Node in the Month of* October.

Radix obſerv'd by Dr. *Halley* at St. *Helena*, Lat. 15° 55′ S. Lon. 7° Weſt from *London*. *Anno* 1677, 28 D. 28 Lat. 4′ 40″ N. [See Dr. *Halley*'s Catalogue of the Southern Stars.]

Add the Years.

Y.		D.	H.	′		′	″	
6	add	8	17	25	Lat.	30	50	Nor. if 2d or 3d paſt Biſſextile.
6	add	9	17	25		30	50	Nor. if Biſſextile, or 1ſt paſt.
7	ſubt.	7	0	9		22	47	South, if 2 Biſſextiles in the time
7	ſubt.	6	0	9		22	47	South, if Biſſextile.
13	add	2	17	34		8	3	Nor. if 3d after Biſſextile.
13	add	1	17	34		8	3	Nor. if Biſſextile.

Angle of *Mercury*'s Viſible Way 8° 15′
Sun's Semidiameter Apparent 16 5″

USE

U S E, *by way of Example.*

I would know the time of the next Tranſit of *Mercury* over the Sun in the Month of *October* ?

	Y.	D.	H.	'		'	''	
Mercury was in the Sun	1723,	29	5	5	Lat.	6	8	No.
Second Period	7	7	0	9		22	47	So.
Mercury will be in the Sun	1730,	22	5	14		16	39	So.

Note, The Years and Minutes are added, and the Days and Hours are ſubtracted.

And to that time	1730,	22	5	14	Lat.	16	39	So.
Add the firſt Period	6	8	17	25		30	50	No.
Mercury in the Sun	1736,	30	22	39		14	11	No.

To theſe times thus found, collect the Anomalies of the Earth and *Mercury* ; and by the Inſtrument, if the two Indexes lye exactly one upon the other, then have the Periods given you the time of the true Conjunction ; elſe not.

OPERATIONS

	W.D.	⊖ Anom.	☿ Anom.		W.D.	⊖ An.	☿ An.
Anno 1730	3	361	834	1736	3	346	9900
Octob.	1	7474	1033	*Octob.*	1	7474	1033
Days 22	1	602	2501	Days 30	B.3	849	3524
Hours 5		6	24	Hor. 22		25	104
Min. 14		1	1	Min. 39		1	3
Thurſday	5	8444	4393	*Saturday*	0	8695	4564

Lay the Earth's Index to 8444 counted in the Circle next the 12 Signs, and *Mercury*'s Index to 4393, his Anomaly counted in the outmoſt Circle ; and you will find them to lye truly upon each other : By which you are aſſur'd that you have the time of the true Conjunction of the Sun and *Mercury*. Prove the other the ſame way.

A Table *of the* Periods *of* Mercury's *Retrogradation in Conjunction with the* Sun, *at the Deſcending Node in the Month of* May.

Radix, obſerv'd by *Hevelius* at *Dantzick*, Lat. 54° 23′ N. 1 h. A. 16′. And by *Hugens*, *Reeves* and *Street*, at *London*, A. C. (Page 114.)

1661 23D. 4h. 52′ Lat. 4′ 27″ N.

Add the Years.

Y.		D.	H.	′		′	″	
13	add	3	7	37	Lat.	16	55	South, if Biſſextile.
13	add	2	7	37		16	55	South.
20	ſubt.	5	8	0		30	57	North, if Biſſextile.
20	ſubt.	4	8	0		30	57	North.
33	ſubt.	2	0	23		11	14	North, if Biſſextile.
33	ſubt.	1	0	23		11	14	North.
46	add	8	14	0		2	53	South, if Biſſextile.
46	add	7	14	0		2	53	South.
79	ſubt.	1	17	9		8	16	North, if Biſſextile.
79	ſubt.	0	17	9		8	16	North.
245	add	1	11	49		22	00	South, if Biſſextile.
245	add	0	11	49		22	00	South.

Angle of the viſible Way of *Mercury*	10°	18′	00″
Semidiameter Sun	0	15	46

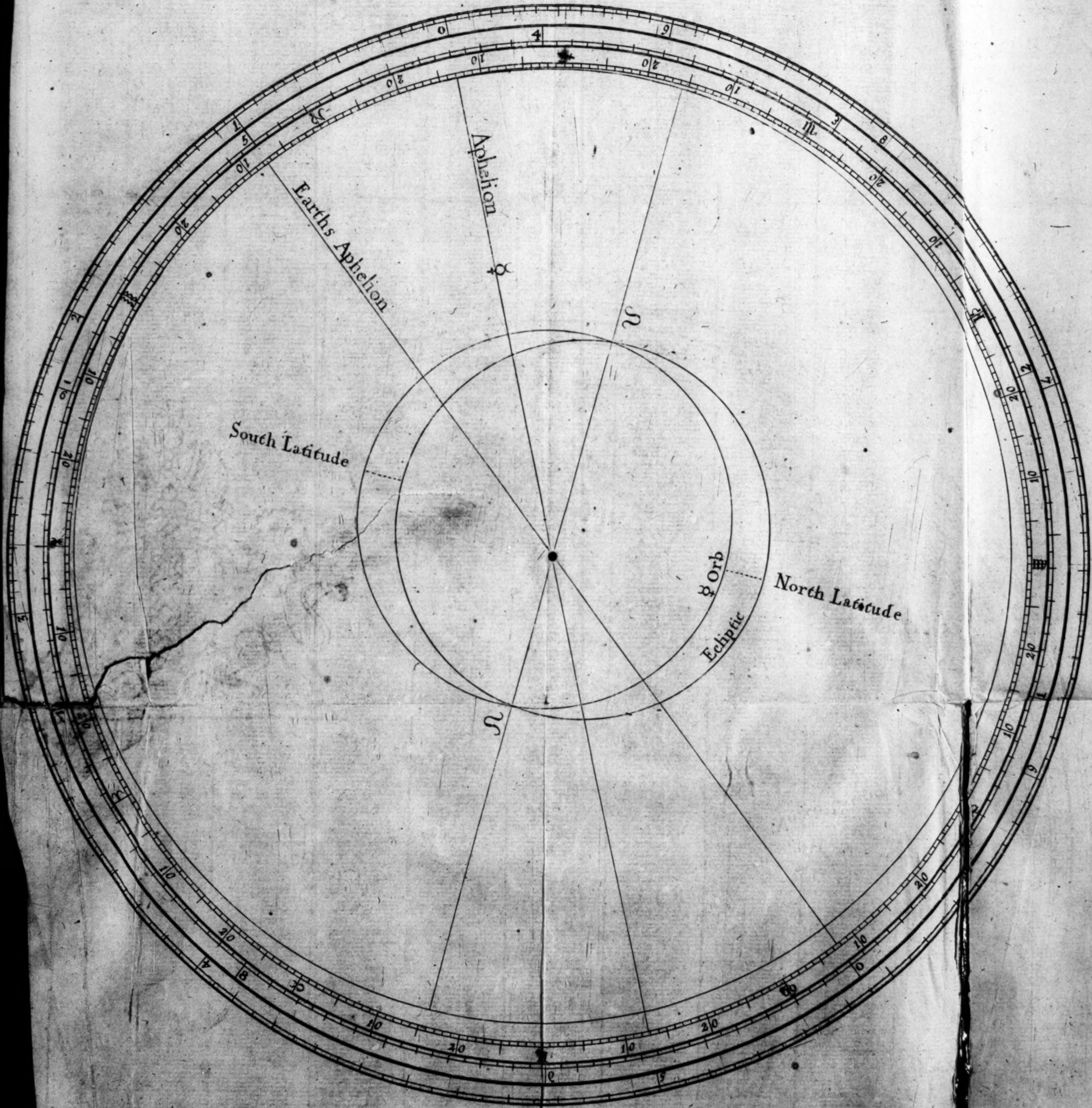
U S E, by way of Example.

When will be the next time that *Mercury* will be ſeen in the Sun in the Month of *April?*

		D.	H.	′		′	″	
Radix	1661.	23	4	52	Lat.	4	27	North.
Period	add 79 ſub.	1	17	9		11	9	North.
☿ in the Sun	1740.	21	11	43		15	36	North.

Or,

Mercury



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Or, the ſame Tranſit may be found thus:

Mercury in the Sun	1720		26 19 43	Lat.	15 21 South.
Period add	20	ſub.	5 8 0		30 57 North.
Mercury in the Sun	1740		21 11 43		15 36 North.

If to the time above found, you collect the Anomalies of the Earth and *Mercury*, you will find them to be 3426, and 8767; to which in their proper Circles lay the Indexes ſeverally, and you will find them lye exactly one upon the other: By which you may conclude, you have the true Time of the Conjunction of the Earth and *Mercury*, if view'd from the Sun; and ſo *Mercury* as view'd from the Earth, will appear in the Sun's Disk.

The Heat in *Mercury* (tho' ſo near the Sun) is not capable of burning any Object, altho' it is ſeven times as great as the Heat of our Summer-Sun, and will cauſe Water to boyl; and therefore the Reaſon why *Mercury* is not calcin'd by the Sun's Heat, is becauſe the Denſity in *Mercury* is proportionably greater than the Sun's Heat there; and conſequently *Mercury* is much denſer than our Earth.

* * *

The Theory of the Moon.

THE *Moon* is a Secondary Planet; and is ſo well known to every Perſon, that to deſcribe her, were only to light a Candle to the Sun.

This Planet (different from all the reſt) reſpects our Earth for her Center; and not only her Globe, but her whole Orb and Syſtem is carry'd round the Sun along with our Earth, in the Space of a Year, as you will more clearly perceive by the Inſtrument. She makes one entire Revolution round our Earth in the ſpace of 27 Days, 7 Hours, 43 Min. 7 Sec. in which time ſhe turneth once round upon her Axis, and is always changing her Phaſes, but ever keeps the ſame Side to our Earth. Her Orb cuts the Earth's Orb in two oppoſite Points call'd *Nodes*, making an Angle therewith of 5 Degr. 18 Min. Theſe Nodes finiſh one Revolution in 18 Years, 224 Days, 3 Hours, moving in *Antecedentia*; which I call the *Mean Period of Eclipſes*, prov'd from A. C. thus:

	S.	°	′	″
☊ Retrograde in 18 Years =	11	18	7	52
The Circle	12	0	0	0
Rem.		11	52	08
Auguſt current ſub. the neareſt, leſs		11	13	36
Rem.			38	32
Days 12 ſub.			38	8
Rem.				24
3 Hours ſub.				24
Rem.				0

From *Jan.* 1, to *Aug.* 12, incluſive, is 224 Days; that is, 18 Years, 224 Days, 3 Hours; that is, the 19th Year Current, the ſame Lunations return that were made the 19th Year before: But the more correct Period of Eclipſes both Solar and Lunar (according to the Learned Mr. *Whiſton*) are 18 *Julian* Years, with 10 Days, when the Cycle or Period contains 5

Leap-Days, and with 11 Days, when 4 Leap-Days: *i.e.* in Leap-Year you add 11 Days, in a common Year 10, with 7 H. 43′ 30″; in which time the direct Mean Motion of the Moon, and her Apogeon in the Ecliptick is nearly ſo much more; and the Retrograde Mean Motion of the Nodes nearly ſo much leſs than entire Revolutions; as the Mean Motion of the Moon from the Sun, upon which all Mean Conjunctions, Oppoſitions and Eclipſes properly depend, exceeds the like entire Revolutions. Prov'd from Aſtronomical Tables thus:

		Long. ☉.				Long ☽.			
		S.	°	′	″	S.	°	′	″
Years	18	11	29	38	32	7	11	37	14
Days	11		10	50	32	4	24	56	25
Hours	7			17	15		3	50	35
Min.	43			1	46			23	36
Sec.	30				1				16
Sum		0	10	48	06	0	10	48	06

		Apog. ☽.				Node ☽.				☽ à ☉.			
		S.	°	′	″	S.	°	′	″	S.	°	′	″
Years	18	0	12	23	39	11	18	7	52	7	11	58	32
Days	11		1	13	32			34	57	4	14	5	53
Hours	7			1	57				56		3	33	20
Min.	43				12				6			21	50
Sec.	30												15
Sum		0	13	39	20	11	18	42	51	11	29	59	50

This Period of Eclipſes 18 Y. 11 D. 7 H. 43′ 30″ being added to any Eclipſe, will give the Mean Time of the next Eclipſe. As, for Example.

	Y.	D.	H.	′	″	
Anno 1724, *May* 11, Sun Eclips'd at			6	36	0	P.M.
Becauſe it is Leap-Year, add	18	11	7	43	30	
Gives *Anno* 1742, *May* Sun Eclips'd		22	14	19	30	
Period add, becauſe 1742 is a Com. Year	18	10	7	43	30	
Gives *Anno* 1760, *June* 1, at			22	03	00	P.M.

A Return of the ſame Solar Eclipſe, &c.

The Moon is always Direct to us at the Earth, and her Mean Diurnal Motion in Longitude is 13 Degr. 10 Min. 35 Sec. in Anomaly 13 Degr. 3 Min. 54 Sec. whoſe Difference is equal to the Mean Diurnal Motion of her Apogeon, 6 Min. 41 Sec. In an Hour ſhe moves 32 Min. 56 Sec. She is at one time nearer the Earth, and at other times farther remov'd; which laſt is call'd her Apogeon, which finiſhes one Revolution in 8 Years, 339 Days, 8 Hours, 58 Minutes, in *Conſequentia*, in an Hour 17 Seconds.

This plainly proves, that ſhe moves in an *Ellipſis* (as all the other Planets do,) and that her Eccentricity is 7070 ſuch Parts as her Mean Diſtance from the Earth is 100000, her Apogeon Diſtance 107070, her Perigeon Diſtance 92930 of the ſame Parts. The Inclination of her Orb in her Quadratures to the Sun, is 5 Degrees, 18 Minutes; but in Conjunction and Oppoſition, only 5 Degr. Her Diſtance from the Earth in Apogeon, is 65 Semidiameters of the Earth; and in Perigeon, her Diſtance is 56. She is 50 $\frac{7}{10}$ times leſſer than our Earth. According to her Mean Diſtance, the Earth's Semidiameter is 1650, and the Moon's 446. [See Page 25.]

And here it is to be obſerv'd in this Planet, as well as in all the reſt, that the Squares of their Periodical Times are as the Cubes of their Mean Diſtances from the Sun; and they all deſcribe equal Area's in equal Intervals of Time.

	′	″
The ☽'s Horizontal Parallax when in Apogeon is	52	59
Her Mean	56	31
Her Perigeon	61	2
And her Apparent Semidiameter in Apogeon	14	19
Mean	15	17
Perigeon	16	30

By reaſon the Moon's Syſtem is carry'd round (along with our Earth) the Sun in the Space of a Year, her Motion is the moſt difficult to be accounted for; and it is almoſt impoſſible to reduce all her Variations to one ſtanding Rule, to be exactly ſhew'd by Inſtrument: Yet, that I have come as near as may be (I preſume) will beſt appear from the Uſe of her Inſtrument, which differs very much from the Inſtruments of the other Planets: For which reaſon I muſt firſt deſcribe it, which I ſhall do in this Place.

As the Moon by reflected Light from the Sun illuminates the Earth; ſo the Earth does more than repay her kindneſs in enlightening the Surface of the Moon, by the Sun's reflex Light, which ſhe diffuſes more abundantly upon the Moon, than the Moon does upon her: For the Surface of the Earth is 50 times greater than that of the Moon; and therefore if both Bodies have the ſame Power of reflecting, in proportion to their Magnitudes, the Earth will ſend back 50 times more Light to the Moon, than it receives from it: For the Earth appears 50 times bigger to the Inhabitants of the Moon, than the Moon does to us. In New Moons the illuminated Side of the Earth is fully turn'd towards the Moon, and will therefore at that time illuminate the dark Side of the Moon, and then the Lunarians will have a full Earth, as we in a ſimilar Poſition have a full Moon. And from hence ariſes that dim Light which we ſee in the Old and New Moon; that is, two or three Days after the Change, (as the Unskill'd in Aſtronomy call it) we ſee the Old Moon in the New Moon's Arms; whereby beſides the bright and ſhining Horns, we can perceive the reſt of her Body behind them, tho' but dark and obſcure.

The Moon, from the Firſt Quarter to the Laſt Quarter is Gibbous; but from the Laſt Quarter, paſſing the Conjunction with the Sun, and ſo on to the Firſt Quarter, is falcated like a Sickle, or horn'd: And in exact Square to the Sun, ſhe is half Full, as the Diagrams on her Inſtrument do plainly ſhew. Alſo by her Horns you may nearly come to know, where the Nonageſima Degree is: For if the upper Horn of the Moon lies even with the lower, ſhe is then in the Nonageſima Degree; but if the upper Horn does more incline to the Eaſt than the lower does, then the Moon is ſhort of the Nonageſima Degree; but if it be more to the Weſt, then ſhe is paſt the 90° of the Ecliptick, except ſhe be diſturb'd by her Libration.

☽'s Inſtrument deſcrib'd.

The Moon's Inſtrument conſiſts of Two Parts, the one fix'd, and the other moveable.

The Fix'd Part is only Two Eccentrick Circles, the Outmoſt of which is divided into 360°, and mark'd with the Twelve Signs of the Zodiack; in this, the Places of the Sun and Earth (which are always diametrically oppoſite to each other) are always found, the Center of which is the Sun; and the other is a ſingle Circle drawn within the Zodiack, and repreſents the Earth's Orb: The Outmoſt divided Circle is the Earth's Anomaly, number'd unequally, as has been ſhewn before.

2. The Second Part of the Inſtrument contains Two moveable Indexes, mark'd with ☉ and ☽, and Three moveable Eccentrick Circles, which are all carry'd round the Sun by the Index mark'd ☉: The undermoſt of theſe Circles is divided into 12 Signs and every Sign into 30 Degrees of the Zodiack, in which the Moon's Longitude, mark'd A, is found.

3. The next Movable Circle, mark'd B, is that I call the *Moon's Apogée*, or Orb, in which her Anomaly is unequally divided; every Diviſion of which repreſents 50; and the Figures 1, 2, 3, *&c.* to 10, ſtand for Thouſands, as has been likewiſe ſhewn before in the other Planets, *Page* 20.

4. The next Circle above that, is the Nodes of the Moon, mark'd with ☊ and ☋; on which there is at each Node a Tooth to cut the Graduations; in the Circumference of this Circle the Moon's Latitude is unequally divided and laid down, mark'd C.

5. Above theſe, is an Index, which I call the *Moon's Index*, mark'd with ☽, upon which is a Moveable Nut, which is always to be kept exactly over the Moon's Orb.

5. Upon this Moveable Nut is ſcrew'd a little Braſs Axis ſtanding perpendicular upon the Moon's Index. Upon this Axis is an Ivory Ball, one half of which is white, and the other half black; by which is ſhewn the Phaſes of the Moon: The middle Part of its white Side muſt be kept to the Sun in time of Practice, *Fig.* 14.

7. Laſtly, Upon the Center of the Moon's Index is a Ball of Box-Wood, to repreſent the Earth, whoſe Equator is divided into 24 equal Parts, or Hours, mark'd with 1, 2, 3, *&c.* to 24; the Hour of the Day or Night upon this Earth being always turn'd towards the Sun, will ſhew where the Moon is in reſpect of the Hour and Azimuth, *Fig.* 15.

The

The U S E.

1. FROM theſe New Aſtronomical Tables, collect the Week-Day, Anomalies of the Earth and Moon, with the Moon's Apogeon, and Node Retrograde, to the Year, Month, Day, Hour and Minute propos'd: Reduce the Apogeon and Node into Signs, Degrees and Minutes, by the *Table for Converting the Anomalies into Signs, Degrees and Minutes,* &c. Or multiply them ſeverally by 12 S. 30°, and 60′, and reject four Places of Figures to the Right Hand of each Product; thoſe on the Left, are Signs, Degrees and Minutes of the Mean Places of the Moon's Apogeon, and North Node for the time propos'd.

2. Lay the Index mark'd with ☉, to the Earth's Anomaly, (firſt having added 5000) in the outmoſt Circle on the fixed Part, there hold it faſt, and it cuts the Sun's true Place in the next divided Circle.

3. To the Place of the Apogeon found in the undermoſt moveable Circle, ſet the Tooth of the middlemoſt moveable Circle, and there ſtay it.

4. Find the Place of that Node the Moon is neareſt to, in the undermoſt moveable Circle, and to it ſet the Tooth of the uppermoſt moveable Circle mark'd with ☊ or ☋. Here ſtay it.

5. Move the Top-Index mark'd with ☽, to the Moon's Anomaly, number'd in the middlemoſt moveable Circle; and then it will cut the lowermoſt moveable Circle in the true Longitude of the Moon, and the uppermoſt in the Latitude.

6. The Indexes and Circles all reſting as before, turn the middle of the white Side of the Ivory-Ball exactly upon the ☾; then obſerve whether the Side mark'd with the firſt Quarter, or that with the laſt Quarter is towards the Earth: If it be the former, then the Moon is increaſing; but if the latter, then ſhe is decreaſing in Light. And thus you will curiouſly ſee all her Phaſes that ſhe makes from Change to Change.

If the two Indexes lye exactly one upon the other, then the Sun and Moon are conjoyn'd, or it is then New Moon; for then being view'd from the Earth, they will appear in one Right Line, and the Moon's dark Side will then be towards the Earth, as *per* Fig. 1, on the Inſtrument; and then if the Moon's Index lie within 18° 10′ 41′ of either Node, the Sun will at that New Moon be Eclips'd ſomewhere on the Earth; or, more properly ſpeaking, the Earth will be depriv'd of the Sun's Light by the Interpoſition of the Moon's opake Body between him and our Sight.

8. But if the End of the Moon's Index, mark'd with ☽, be turn'd from the Sun, and ſo, that the two Indexes lie in a right Line one upon another, then is the Earth interpos'd between the two Luminaries, and the Moon is now at the Full, and her light Side is turn'd towards the Earth. If then the Moon's Index be not more than 11° 58′ 3″ from either Node, the Moon will at that Full paſs thro' the Earth's Shadow, and therefore be depriv'd of the Sun's borrow'd Light: And if the Diſtance from the Node be leſs than 11° 58′ 3″, and more than 6°, it will be a Partial Eclipſe, the Digits will be leſs than 12. But if the Diſtance aforeſaid be leſs than 6°, then ſhe will be totally Eclips'd; ſo that the Quantity of the Eclipſe will be more or leſs, proportionable to her Diſtance from the Node. Here *Note*, that the Solar Eclipſe always falls at the New Moon, and the Lunar at the Full. And the Quantity may nearly enough be known (for common Uſe) by the following Table.

A

* * *

A TABLE *ſhewing the Digits of the* Moon *Eclips'd, by having her Diſtance from her Node.*

NOTE, Altho' the Moon be the ſame Diſtance from the Node, yet becauſe her Anomaly is not the ſame, therefore the Digits cannot be the ſame, at the ſame diſtance from the Node; becauſe her Motion and Diameter is not the ſame in all Places of her Orbit; and ſhe paſſing thro' a greater or leſſer Portion of the Earth's Shadow, makes a Difference in the Digits. Therefore I only give this General Table, for the uſe of the Moon's Inſtrument, intending it only for a general View of the Quantity of her Eclipſe.

Diſt.	*Digits.*	
°	°	′
0	23	0
1	20	30
2	18	0
3	16	0
$4\frac{1}{2}$	13	32
5	11	0
$6\frac{5}{8}$	9	13
$7\frac{2}{3}$	7	49
$8\frac{1}{3}$	5	9
9	3	53
$10\frac{3}{5}$	1	52
11	0	30
12	0	0

Laſtly, If the Hour of the Day or Night be kept turn'd towards the Sun, as mark'd upon the Ball repreſenting the Earth, it will repreſent to you the Rotation of the Earth upon its own Axis, in the ſpace of about 24 Hours: It will alſo repreſent to you the Poſition of the Moon, in reſpect of the Hour and Azimuth.

N. B. You muſt always be very careful to place the ſame Degree the Sun is in, found now in the undermoſt moveable Circle, exactly over the Line upon the Sun's Index; and by keeping the Earth upon its Orb, (which is done by the Sliding Nut) the Sun's Apogeon and Perigeon, and her Aphelion and Perihelion are ſeen: And likewiſe by keeping the Moon truly in her Orb, her Apogeon and Perigeon are demonſtrated at all times.

And if by theſe Numbers her Mean Anomaly
be { 0 Apogeon.
2500 Mean.
5000 Perigeon.

Example. *Anno* 1724, *Decemb.* 11, at Noon, I would know the Place of the Moon, her Phaſes, *&c.*

The Operation ſtands thus:

	W.D.	Anom. ⊖.	Anom. ☽.	Apog. ☽.	Node ☽.	
Radix 1724,	2	349	7864	5387	1735	from
Decemb.	6	9144	1214	1034	491 }	add
Day 11. Biſſex.	5	329	4356	37	18 }	
Sum	6	9822	3434	6458	509	*Sum ſub.*
Add		5000		♏ 22° 29′	1226 = ♉ 14° 9′	
Sun's Anomaly		9822				

By the Work, the Day of the Week is the Sixth, or *Friday*, the Moon's Longitude ♓ 20°, and Latitude 4° ¼ South deſcending; and ſhe is almoſt half enlighten'd, *&c.*

Example 2. I would know the Moon's Place in Longitude and Latitude, her Phaſes, *&c.* upon the 14*th* Day of *May* 1725, at Noon?

OPERATION.

	W.D.	Anom. ⊖.	Anom. ☽.	Apog. ☽	Node ☽.
Radix 1724,	4	369	692	6520	1197
May	2	3285	3548	371	177 }
Day 14	0	383	5082	43	21 }
Sum	6	4037	9322	6934	198 ſub.
Add		5000		♐ 9° 37′	999 = ♉ 6°
Sun's Anomaly		9037			

By the Work and Inſtrument, I find the ☽ in ♏ 17° ⅔, with 1° Lat. S.A. nearly ſhewing a full Face to the Earth, Increaſing.

EX.

EXAMPLE 3.

	W.D.	Anom.⊖.	Ano.☽.	Apog.☽.	Node☽.	
Radix 1725,	4	369	692	6520	1197	
Auguſt	3	5804	6935	656	312	}
Day 1 Com.	1	27	363	3	1	}
Sum	1	6200	7990	7179	313	ſub.
				9 1		
Add		5000		♐ 18 35	584=♉1° 50	
Sun's Anomaly		1200				

The Day of the Week is *Sunday*, ☽ in ♎ 12° ⅓, Lat. 1° ¼. N. D. near 1 Qr.

EXAMPLE 4.

	W.D.	Anom.⊖.	Ano.☽.	Apog.☽.	Node☽.	
Radix 1725	4	369	692	6520	1197	
October	1	7474	9068	845	402	}
Day 18.	4	493	6533	56	26	}
Sum	2	8336	6293	7421	428	ſub.
Add		5000		♐ 27° 9′	769=♈ 27° 40′	
Anom. Sun		3336				

The Week-Day is *Monday*, Long. ☽ ♌ 19 Deg. Lat. 4 Deg. 56′. N. D. Phaſe near half decreas'd.

THE Light of the Moon is ſo very weak, even in the Full, that the leaſt Heat could never be perceiv'd from it: Nay, I could never gather any Heat from her by applying the beſt burning-Glaſs I could procure, any more than by reflecting the Sun's Light by a Mirrour upon my Hand, *&c.* For the Quantity of Light decreaſing in a duplicate Proportion of the Diſtances; and conſequently the Quantity of the Sun's Rays reflected from the Moon to the Earth, as compar'd with the Quantity of them upon the Moon it ſelf, is reciprocally in proportion to the Square of the Diſtance of the Moon from the Earth to the Semidiameter of the Moon. From whence it will appear by Computation, that the Light of the Moon upon the Earth is no more than a fifty thouſandth Part of the Light of the Sun.

Mr. *Romer* makes Light 11 Minutes in coming to us from the Sun; Sir *Iſaac Newton* 10 Minutes, *Philoſ. Tranſ.* Numb. 136; but Mr. *Pound* found it to come in 7 Minutes of time, *Philoſ. Tranſ.* Numb. 361: And therefore the Sun's Light, as reflected from the Moon to the Earth, will come to us from the Moon in $1'' \, 49'''$. [See Pages 25, and 33,] where you have the Diſtances of the Sun and Moon from the Earth.

And here I ſhall ſet down the Names of the Moon's Phaſes, as ſhe ſhews them to us on the Earth, and as they are truly repreſented to us by her Inſtrument.

From the Laſt Quarter, paſſing the Conjunction, to the Firſt Quarter, her Name is *Minoides*, *Falcata*, that is, horn'd like a Sickle.

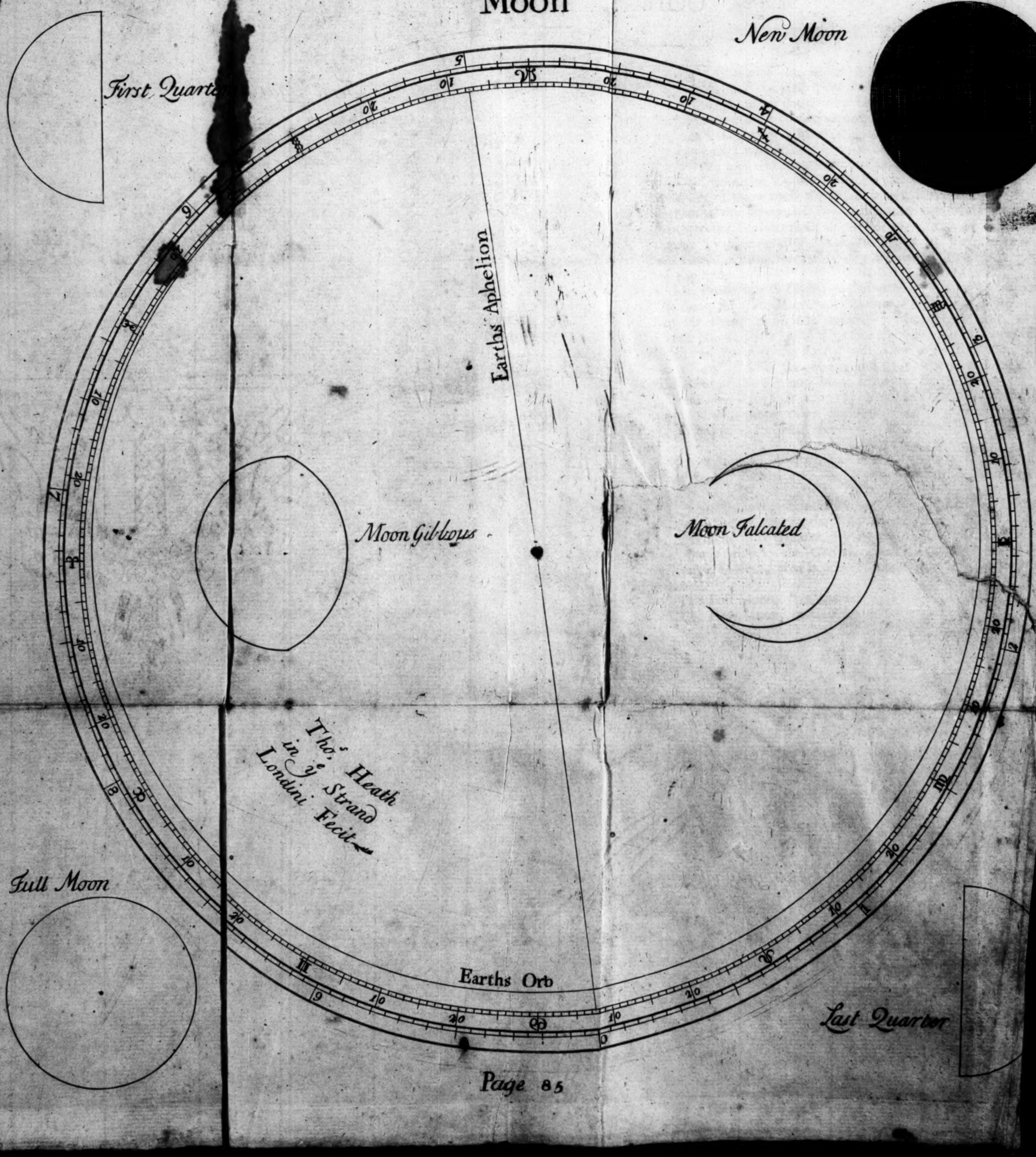
At the Quarters, ſhe is call'd *Diochotomos*, *Dimidia*, or *Dimidiata*, Biſſected, that is, the Half Moon.

From the Firſt Quarter, paſſing the Full, to the Laſt Quarter, ſhe is call'd by the Greeks, *Amphichyrtos*; by the Latins, *Utrinque*, *Gibboſa*; that is, almoſt round like a Bowl, on both ſides.

The Full Moon, *Plenilunium.*

The New Moon, *Interlunium.*

Moon


First Quarter
New Moon
Earths Aphelion
Moon Gibbous
Moon Falcated
Thos. Heath
in ye Strand
Londini Fecit
Full Moon
Earths Orb
Last Quarter

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The Moon is ſometimes obſerv'd to be higher when on the Meridian in *Cancer*, and lower on the Meridian in *Capricorn*, than the Sun can be when in the ſame Signs. This is occaſion'd by the Obliquity of her Orb, and happens once in every Revolution of her Nodes. The Sun's Meridian Altitude on the 10*th* of *June* at *London*, is 61 Degr. 58 Min. but when the Moon's North Node is in the very beginning of *Aries*, which will be *March* 25, 1727, her Meridian Altitude will be when in *Cancer* 66 Degr. 55 Min. by allowing 21 Min. for her Parallax in Altitude, ſuppoſing her near a middle Diſtance from the Earth. But on the 31*ſt* of the ſame Month ſhe may be obſerv'd in *Capricorn* on the Meridian, elevated above the Horizon no more than 8 Degr. 45 Min. by allowing 55 Min. for her Parallax in Altitude.

Again, when the Moon's North Node is in or near the Equinoctial Point *Libra*, which will be in the Month of *July* 1736, then the Moon in the beginning of *Cancer* will have no more than 56 Degr. 10 Min. of Meridian Altitude, by allowing 30 Min. for her Parallax in Altitude.

And Laſtly, When the Moon is in the Firſt Scruple of *Capricorn*, and the North Node in the Firſt Scruple of *Libra*, her Meridian Altitude will be at *London* 19° 23′, by allowing 53′ for her Parallax in Altitude.

And thus you ſee what a vaſt Difference there is in the Moon's Meridian Altitude, when in the ſame Sign, at different times, which always happens once in every Revolution of her Nodes, which is in leſs time than 19 *Julian* Years.

The Synodical Months, or the Times between each Lunation are very unequal, by reaſon of the Earth's Unequal Motion: For in *December*, when the Earth is in Perihelion, the Synodical Month is longer by about 12 Hours, than in *June*, when the Earth is in Aphelion. In the former Caſe it is 29 Days, 19 Hours; but in the latter, there are only 29 Days, 7 Hours for the Time of the Lunation.

A TABLE *of the Equation of* Time, *for Reducing of Equal to Apparent time,* & contrà; *and the Regulating of* Clocks *and* Watches.

Days	Januar.			Februa.			March.			April.			May.			June.		
	′		″	′		″	′		″	′		″	′		″	′		″
1	9		10	15	Clock to faſt	0	10	Clock too faſt	16	0	Faſt	48	4	Clocks too ſlow	8	1	Slow.	1
2	9	Clocks too faſt	34	14		59	9		58	0		32	4		10	0		49
3	9		56	14		57	9		40	0		16	4		11	0		37
4	10		15	14		52	9		22	0	*	0	4		13	0		25
5	10		34	14		48	9		4	0		15	4		11	0		12
6	10		55	14		43	8		46	0	Clocks too ſlow	30	4		9	0		1
7	11		14	14		38	8		28	0		44	4		8	0	*	14
8	11		33	14		30	8		10	0		58	4		6	0		26
9	11		52	14		22	7		52	1		10	4		5	0		40
10	12		9	14		15	7		34	1		24	4		3	0		54
11	12		24	14	Sub. a Equal Time.	6	7	Sub. à Equ. Time.	14	1		37	4	Add to Equal Time.	0	1		8
12	12		40	13		57	6		54	1		49	3		56	1	Add to Equal Time.	23
13	12		55	13		49	6		36	2		1	3		51	1		36
14	13		10	13		40	6		19	2		11	3		46	1		49
15	13		22	13		30	6		0	2		22	3		40	2		0
16	13	Sub. à Equal Time	35	13		20	5		40	2	Add to Equal Time.	32	3		34	2		12
17	13		46	13		10	5		20	2		41	3		27	2		22
18	13		58	13		0	5		0	2		51	3		20	2		35
19	14		8	12		48	4		40	3		1	3		12	2		46
20	14		17	12		36	4		20	3		10	3		3	2		58
21	14		25	12		24	4		1	3		19	2		54	3		9
22	14		31	12		11	3		42	3		27	2		45	3		20
23	14		36	11		57	3		23	3		35	2		36	3		31
24	14		42	11		42	3		5	3		40	2		26	3		42
25	14		46	11		36	2		48	3		45	2		17	3		53
26	14		50	11		10	2		30	3		50	2		6	4		2
27	14		54	10		52	2		13	3		55	1		57	4		12
28	14		56	10		34	1		55	4		0	1		46	4		21
29	14		59				1		37	4		3	1		35	4		31
30	15		0				1		20	4		6	1		23	4		40
31	15		0				1		4				1		12			

A TABLE *of the Equation of* Time, *for Reducing of Equal to Apparent time*, & contrà; *and the Regulating of* Clocks *and* Watches.

Days	July.		Auguſt		Sept.		Octob.		Nov.		Dec.	
	′	″	′	″	′	″	′	″	′	″	′	″
1	4	48	4	27	3	51	13	33	15	30	5	38
2	4	56	4	16	4	12	13	47	15	22	5	11
3	5	3	4	5	4	34	14	0	15	13	4	44
4	5	10	3	54	4	56	14	12	15	3	4	7
5	5	16	3	42	5	17	14	24	14	52	3	48
6	5	21	3	30	5	38	14	35	14	40	3	20
7	5	26	3	18	6	0	14	45	14	27	2	50
8	5	31	3	3	6	22	14	55	14	13	2	19
9	5	34	3	50	6	42	15	4	13	58	1	48
10	5	37	2	37	7	4	15	13	13	42	1	16
11	5	40	2	28	7	24	15	22	13	25	0	44
12	5	42	2	8	7	45	15	32	13	7	0	12
13	5	44	2	53	8	4	15	40	12	48	0	21
14	5	45	1	38	8	24	15	47	12	29	0	51
15	5	46	1	24	8	44	15	52	12	10	1	21
16	5	48	1	9	9	3	15	56	11	50	1	51
17	5	48	0	52	9	23	16	0	11	30	2	21
18	5	48	0	35	9	43	16	4	11	10	2	51
19	5	47	0	17	10	2	16	3	10	49	3	21
20	5	45	0	0	10	20	16	7	10	28	3	50
21	5	40	0	18	10	40	16	8	10	4	4	18
22	5	36	0	36	10	58	16	9	9	40	4	47
23	5	30	0	55	11	16	16	9	9	14	5	13
24	5	26	1	14	11	35	16	9	8	48	5	40
25	5	20	1	30	11	54	16	8	8	21	6	8
26	5	15	1	47	12	12	16	6	7	53	6	35
27	5	8	2	7	12	30	16	2	7	25	7	0
28	5	0	2	27	12	47	15	57	6	58	7	29
29	4	53	2	48	13	4	15	51	6	31	7	53
30	4	46	3	8	13	20	15	45	6	4	8	17
31	4	35	3	37			15	37			8	41
	Clocks too faſt Sub. à Equal Time.		Clocks too faſt Sub à Equal Time. * Too ſlow. Add.		Clocks too ſlow. Add to Equal Time.		Clocks too ſlow. Add to Equal Time.		Clocks too ſlow. Add to Equal Time.		too ſlow. Add to Eq. Time. * Clocks too faſt. Sub. à Equal Time.	

A

A TABLE *for Converting* Hours *and* Minutes *of* Time *into* Degrees *and* Minutes *of the Equinoctial,* & contrà.

Time	Motion.	Time	Motion		Time	Motion		Time.	Motion.	
Hour	°	'	°	'	'	°	'	'	°	'
'	'	''	'	''	''	'	''	''	''	''
''	''	'''	''	'''	'''	''	'''	'''	'''	'''
1	15	1	0	15	21	5	15	41	10	15
2	30	2	0	30	22	5	30	42	10	30
3	45	3	0	45	23	5	45	43	10	45
4	60	4	1	0	24	6	0	44	11	0
5	75	5	1	15	25	6	15	45	11	15
6	90	6	1	30	26	6	30	46	11	30
7	105	7	1	45	27	6	45	47	11	45
8	120	8	2	0	28	7	0	48	12	0
9	135	9	2	15	29	7	15	49	12	15
10	150	10	2	30	30	7	30	50	12	30
11	165	11	2	45	31	7	45	51	12	45
12	180	12	3	0	32	8	0	52	13	0
13	195	13	3	15	33	8	15	53	13	15
14	210	14	3	30	34	8	30	54	13	30
15	225	15	3	45	35	8	45	55	13	45
16	240	16	4	0	36	9	0	56	14	6
17	255	17	4	15	37	9	15	57	14	15
18	270	18	4	30	38	9	30	48	14	30
19	285	19	4	45	39	9	45	59	14	45
20	300	20	5	0	40	10	0	60	15	0
21	315									
22	330									
23	345									
24	360									

Example. Let it be requir'd to reduce the Degrees of Longitude of Agra. into Time.

OPERATION.

	° h.	'	''
	75=5	0	0
	3=0	12	0
	45'=0	3	0
	5 =0	0	20
Sum	5	15	20

So the Difference of Meridians in Time from *London*, is 5 Hours 15 Min. 20 Sec.

A

New Aſtronomical TABLES, *ſhewing the Mean Anomalies of all the* Planets *in Years and Months Compleat.*

	YEARS Compleat.	W.D.	⊖	♄	♃	♂	♀	☿	☽ A-nom.	☽ A-pog.	☽'s *Node.*
	1	1	9993	339	842	5313	6244	1492	2464	1130	537
	2	2	9986	678	1685	626	2488	2983	4928	2259	1074
	3	3	9979	1018	2527	5939	8731	4475	7393	3389	1611
B	4	5	9999	1358	3372	1267	5020	6080	220	4521	2149
	5	6	9992	1697	4215	6580	1264	7572	2685	5651	2686
	6	0	9985	2036	5057	1893	7508	9063	5150	6780	3223
	7	1	9978	2375	5900	7206	3751	555	7614	7910	3760
B	8	3	9999	2715	6744	2534	40	2160	442	9043	4298
	9	4	9992	3055	7587	7847	6284	3652	2906	172	4835
	10	5	9985	3394	8429	3160	2527	5144	5370	1302	5372
	11	6	9977	3733	9272	8474	8771	6635	7834	2431	5909
B	12	1	9998	4073	117	3801	7060	8241	662	3564	6447
	13	2	9991	4412	959	9114	1303	9732	3126	4693	6984
	14	3	9984	4751	1801	4427	7547	1224	5590	5823	7521
	15	4	9977	5091	2644	9741	3791	2715	8055	6953	8058
B	16	6	9997	5431	3489	5068	79	4321	882	8085	8596
	17	0	9990	5770	4331	381	6323	5812	3346	9215	9133
	18	1	9983	6109	5174	5694	2567	7304	5811	344	9670
	19	2	9976	6448	6016	1008	8811	8796	8276	1474	207
B	20	4	9996	6789	6861	6335	5099	402	1104	2606	746
	January.	1	0	0	0	0	0	0	0	0	0
	February.	4	0849	29	72	451	1380	3524	1250	96	46
	March.	4	1615	55	137	859	2626	6707	1411	183	87
	April.	0	2464	84	209	1310	4005	231	2661	279	132
	May.	2	3285	112	278	1747	5340	3641	3548	371	177
	June.	5	4134	140	350	2198	6720	7165	4798	467	222
	July.	0	4955	168	419	2635	8055	575	5685	560	265
	Auguſt.	3	5804	197	490	3086	9435	4099	6935	656	312
	Septemb.	6	6653	226	562	3539	814	7623	8181	752	357
	October.	1	7474	254	630	3974	2149	1033	9068	845	402
	Novemb.	4	8323	283	702	4425	3529	4557	318	941	447
	Decemb.	6	9144	310	771	4862	4864	7967	1214	1034	491

New Aſtronomical TABLES, ſhewing the Mean Anomalies of all the PLANETS in Years of Chriſt Current.

Years of Chriſt.	W.	D.	⊕	♄	♃	♂	♀	☿	☽ Anom.	☽ Apog.	☽'s Node.
Radix 1	These Years are all first past. B	5	0648	5238	386	7557	3439	2542	5561	7840	7468
201		3	0616	3132	8995	911	4427	6579	6597	3905	12
401		1	0583	1027	7605	4265	5415	598	7633	9970	2556
601		6	0551	8922	6214	7619	6403	4626	8669	6035	5101
701		5	0535	2869	519	9296	1897	6640	4187	9067	1373
901		3	0502	763	9129	2650	2885	678	5223	5132	3917
1601		3	0381	8396	9260	4387	1340	4765	3848	6359	7821
1681		5	0376	5555	6704	9728	1736	6366	8264	6785	4839
1701		2	0372	2345	3563	6064	6835	6771	9368	9391	4093
1721		*6	0371	9134	422	2399	1930	7181	472	1197	3346
1722		0	0363	9473	1261	7711	8174	8673	2939	3127	2809
1723		1	0355	9812	2103	3024	4418	164	5400	4257	2272
1724		2	0349	152	2946	8337	662	1657	7864	5387	1735
1725		4	0369	492	3790	3665	6951	3262	692	6520	1197
1726		5	0362	831	4632	8978	3195	4754	3156	7650	660
1727		6	0355	1170	5475	4292	9439	6246	5620	8780	123
1728	B	0	0348	1510	6318	9605	5683	7738	6084	9910	9586
1729		2	0368	1850	7162	4933	1972	9344	911	1043	9048
1730		3	0361	2189	8094	246	8216	834	3776	2173	8511
1731		4	0354	2528	8847	5559	4460	2326	5840	3302	7974
1732	B	5	0347	2868	9689	872	704	3818	8304	4432	7437
1733		0	0367	3208	533	6200	6993	5424	113	5564	6899
1734		1	0360	3547	1376	1515	3237	6916	3595	6693	6362
1735		2	0353	3886	2218	6825	9481	8408	6059	7822	5825
1736	B	3	0346	4226	3060	2139	5725	9900	8523	8954	5288
1737		5	0366	4566	3907	7467	2014	1506	1351	88	4750
1738		6	0359	4905	4749	2780	8258	2997	3815	1218	4213
1739		0	0352	5244	5595	8093	4496	4487	6281	2342	3676
1740	B	1	0345	5583	6437	3406	746	5979	8745	3472	3139
1741		3	0365	5923	7282	8734	7035	7585	1572	4605	2601
1742		4	0358	6262	3124	4047	3279	9077	4036	5735	2064
1743		5	0351	6601	8966	9360	9523	569	6500	6865	1527
1744	B	6	0344	6940	9808	4673	5767	2061	8964	7995	990

The First Part of this TABLE *ſhews the Anomalies of all the* Planets *for Years of Chriſt Current; the Latter Part, for Years Compleat.*

Years of Chriſt.	W.D.		⊖	♄	♃	♂	♀	☿	☽ A-nom.	☽ A-pog.	☽'s *Node.*
1745		1	0364	7282	655	0002	2048	3664	1794	9125	452
1746		2	0357	7621	1497	5315	8992	5156	4258	255	9915
1747		3	0350	7960	2339	628	4535	6648	6723	1385	9378
1748	B.	4	0343	8299	3181	5941	779	8140	9186	2515	8841
1749		6	0364	8640	4025	1269	7068	9745	2014	3648	8303
1750		0	0357	8979	4867	6582	3312	1237	4478	4778	7766
1751		1	0350	9318	5709	1895	9556	2729	6942	5907	7229
1752	B.	2	0342	9657	6551	7208	5800	4221	9407	7036	6692
1753		4	0363	9998	7395	2536	2088	5826	2234	8168	6154
1754		5	0355	337	8237	7849	8332	7318	4698	9300	5617
1755		6	0348	676	9079	3162	4576	8810	7163	428	5080
1756	B.	0	0342	1015	9921	8475	820	302	9627	1557	4543
1757		2	0362	1356	771	3801	7108	1907	2454	2690	4005
1758		3	0355	1695	1613	9114	3352	3399	4918	3819	3468
1759		4	0348	2034	2455	4427	3596	4891	7382	4948	2931
1760	B.	5	0341	2373	3297	9740	5840	6383	9847	6078	2394
1761		0	0364	2714	4141	5069	2127	7987	2677	7210	1855
Years Compleat,											
20		4	9996	6789	6861	6335	5099	402	1104	2606	746
40		1	9993	3578	3722	2671	198	805	2208	5213	1491
60		5	9989	367	583	9006	5297	1208	3312	7819	2237
80		2	9986	7156	7444	5341	396	1601	4416	426	2982
100		6	9982	3947	4305	1677	5494	2014	5518	3032	3728
200		5	9964	7894	8609	3354	988	4028	1036	6065	7456
300		4	9946	1841	2914	5031	6482	6042	6554	9097	1184
400		3	9928	5789	7219	6708	1976	8056	2072	2130	4912
500		2	9910	9737	1524	8385	7470	70	7590	5162	8639
600		1	9892	3668	5828	0062	2964	2084	3108	8194	2367
700		0	9887	7633	132	1738	8455	4097	8625	1227	6096
800		6	9869	1578	4437	3415	3949	6111	4143	4259	9823
900		5	9851	5526	8741	5092	9443	8125	9661	7292	3551
1000		4	9838	9474	3044	6768	4936	139	5179	324	7279

A TABLE *of the Mean Anomalies of the* Planets *in Days.*

Days.	W. D.	☉	♄	♃	♂	♀	☿	☽ A-nom.	☽ A-pog.	☽'s *Node.*
1	1	27	1	2	15	45	114	363	3	1
2	2	55	2	5	29	89	227	726	6	3
3	3	82	3	7	44	134	341	1089	9	4
4	4	110	4	9	58	178	455	1452	12	6
5	5	137	5	12	73	223	568	1815	15	7
6	6	164	6	14	87	267	682	2178	19	9
7	0	192	7	16	102	312	796	2541	22	10
8	1	219	7	18	116	356	909	2904	25	12
9	2	246	8	21	131	401	1023	3267	28	13
10	3	274	9	23	146	445	1137	3630	31	15
11	4	301	10	25	160	490	1250	3993	34	16
12	5	329	11	28	175	534	1364	4356	37	18
13	6	356	12	30	189	579	1478	4719	40	19
14	0	383	13	32	204	623	1591	5082	43	21
15	1	411	14	35	218	668	1705	5444	46	22
16	2	438	15	37	233	712	1819	5807	50	24
17	3	465	16	39	247	757	1932	6170	53	25
18	4	493	17	42	262	801	2046	6533	56	26
19	5	520	18	44	277	846	2160	6896	59	28
20	6	548	19	46	291	890	2274	7259	62	29
21	0	575	20	48	306	935	2387	7622	65	31
22	1	602	20	51	320	979	2501	7985	68	32
23	2	630	21	53	335	1024	2615	8348	71	34
24	3	657	22	55	349	1068	2728	8711	74	35
25	4	684	23	58	364	1112	2842	9073	77	37
26	5	712	24	60	378	1157	2956	9436	80	38
27	6	739	25	62	393	1202	3069	9799	84	40
28	0	767	26	65	408	1246	3183	161	87	41
29	1	794	27	67	422	1291	3297	524	90	43
30	2	821	28	69	437	1335	341[illegible]	887	93	44
31	3	849	29	72	451	1380	3524	1250	96	46
32	4	876	30	74	466	1424	3638	1612	99	47

The Mean Anomalies of the Planets *in* Hours.

Hours.	⊖	♄	♃	♂	♀	☿	☽ *Anom.*	☽ *Apog.*	☽'s Node.
1	1	0	0	1	2	5	15	0	0
2	2	0	0	1	4	9	30	0	0
3	3	0	0	2	6	14	45	0	0
4	5	0	0	2	7	19	60	1	0
5	6	0	0	3	9	24	76	1	0
6	7	0	1	4	11	28	91	1	0
7	8	0	1	4	13	33	106	1	0
8	9	0	1	5	15	38	121	1	0
9	10	0	1	5	17	43	136	1	1
10	11	0	1	6	19	47	152	1	1
11	13	0	1	7	20	52	167	1	1
12	14	0	1	7	22	57	182	2	1
13	15	1	1	8	24	62	197	2	1
14	16	1	1	8	26	66	212	2	1
15	17	1	1	9	28	71	227	2	1
16	18	1	2	10	30	76	242	2	1
17	19	1	2	10	32	81	257	2	1
18	21	1	2	11	33	85	273	2	1
19	22	1	2	12	35	90	288	2	1
20	23	1	2	12	37	95	303	3	1
21	24	1	2	13	39	99	318	3	1
22	25	1	2	13	41	104	333	3	1
23	26	1	2	14	43	109	348	3	1
24	27	1	2	15	45	114	363	3	1

Min.	☽ Ano.	Min.	☽ Ano.
4	1	31	8
8	2	35	9
12	3	39	10
16	4	43	11
20	5	47	12
24	6	51	13
28	7	55	14
31	8	59	15

In the Leap-Year, after *February*, add the Motion of a Day more to the reſt.

A TABLE *of the Inclinations, or Heliocentrick Latitudes of the Five Primary Planets.*

Anom.	♄		♃		♂		♀		☿	
	°	'	°	'	°	'	°	'	°	'
0	1N	1	1N	20	1N	50	2 S	36	3 S	15
50	0	57	1	20	1	49	2	39	3	22
100	0	53	1	20	1	48	2	42	3	28
150	0	49	1	19	1	47	2	45	3	34
200	0	45	1	19	1	46	2	48	3	40
250	0	41	1	18	1	45	2	52	3	47
300	0	38	1	18	1	44	2	55	3	55
350	0	33	1	17	1	43	2	58	4	2
400	0	29	1	17	1	42	3	1	4	10
450	0	25	1	16	1	41	3	4	4	19
500	0	21	1	16	1	40	3	8	4	27
550	0	17	1	15	1	38	3	10	4	33
600	0	13	1	14	1	37	3	11	4	39
650	0	9	1	13	1	35	3	13	4	45
700	0	5	1	12	1	33	3	14	4	51
750	0	1	1	11	1	31	3	16	4	57
800	0 S.	5	1	10	1	29	3	17	4	4
850	0	9	1	9	1	27	3	18	5	10
900	0	13	1	8	1	25	3	20	5	16
950	0	17	1	7	1	24	3	21	5	23
1000	0	12	1	6	1	23	3	23	5	29
1050	0	26	1	4	1	21	3	23	5	34
1100	0	30	1	3	1	19	3	24	5	39
1150	0	34	1	2	1	17	3	24	5	44
1200	0	38	1	0	1	15	3	24	5	49
1250	0	42	0	59	1	13	3	24	5	54
1300	0	46	0	57	1	11	3	23	5	59
1350	0	50	0	55	1	8	3	22	6	3
1400	0	54	0	54	1	5	3	21	6	8
1450	0	58	0	52	1	2	3	19	6	13
1500	1	3	0	50	0	59	3	17	6	17
1550	1	7	0	48	0	56	3	14	6	20
1600	1	11	0	45	0	53	3	12	6	23
1650	1	15	0	43	0	50	3	9	6	26

A

A TABLE *of the Inclinations, or Heliocentrick Latitudes of the Five Primary Planets.*

Anom.	♄		♃		♂		♀		☿	
	°	′	°	′	°	′	°	′	°	′
1700	1 N	19	0 N	40	0 N	47	3 S	9	6	28
1750	1	23	0	37	0	44	3	6	6	30
1800	1	27	0	35	0	41	3	4	6	33
1850	1	31	0	33	0	38	3	1	6	36
1900	1	34	0	32	0	35	2	58	6	39
1950	1	37	0	30	0	33	2	56	6	44
2000	1	40	0	29	0	30	2	55	6	47
2050	1	44	0	27	0	27	2	52	6	48
2100	1	48	0	24	0	24	2	49	6	49
2150	1	52	0	22	0	21	2	46	6	50
2200	1	54	0	19	0	18	2	42	6	51
2250	1	57	0	17	0	15	2	37	6	52
2300	1	59	0	14	0	12	2	32	6	53
2350	2	2	0	12	0	9	2	27	6	54
2400	2	4	0	10	0	6	2	23	6	54
2450	2	6	0	7	0	2	2	18	6	53
2500	2	9	0	5	0 S	3	2	14	6	53
2550	2	11	0	3	0	6	2	9	6	50
2600	2	13	0	0	0	10	2	4	6	47
2650	2	15	0 S	3	0	13	1	58	6	43
2700	2	17	0	5	0	16	1	53	6	39
2750	2	19	0	8	0	20	1	48	6	35
2800	2	21	0	11	0	23	1	43	6	31
2850	2	23	0	14	0	26	1	38	6	28
2900	2	24	0	16	0	30	1	32	6	26
2950	2	26	0	19	0	34	1	26	6	24
3000	2	27	0	21	0	38	1	20	6	23
3050	2	28	0	23	0	41	1	14	6	17
3100	2	29	0	25	0	45	1	8	6	11
3150	2	30	0	27	0	49	1	2	6	4
3200	2	30	0	29	0	53	0	56	5	57
3250	2	30	0	31	0	57	0	50	5	50
3300	2	29	0	34	1	1	0	44	5	43
3350	2	29	0	36	1	3	0	38	5	36

A TABLE *of the Inclinations, or Heliocentrick Latitudes of the Five Primary* Planets.

Anom.	♄		♃		♂		♀		☿	
	°	′	°	′	°	′	°	′	°	′
3400	2	S 29	0	S 38	1	S 5	0	S 31	5	S 29
3450	2	29	0	41	1	7	0	24	5	21
3500	2	29	0	44	1	10	0	18	5	8
3550	2	28	0	46	1	12	0	12	4	59
2600	2	27	0	48	1	15	0	6	4	49
3650	2	26	0	50	1	18	0	N 0	4	37
3700	2	24	0	53	1	20	0	6	4	23
3750	2	23	0	55	1	23	0	12	4	9
3800	2	22	0	57	1	26	0	19	3	55
3850	2	20	0	59	1	29	0	26	3	42
3900	2	19	1	0	1	32	0	33	3	28
3950	2	17	1	2	1	34	0	40	3	13
4000	2	15	1	3	1	36	0	47	2	56
4050	2	13	1	5	1	38	0	53	2	40
4100	2	10	1	6	1	41	0	59	2	23
4150	2	7	1	8	1	42	1	5	2	5
4200	2	4	1	9	1	43	1	11	1	46
4250	2	1	1	11	1	44	1	17	1	26
4300	1	58	1	12	1	46	1	23	1	6
4350	1	55	1	13	1	47	1	29	1	46
4400	1	52	1	14	1	48	1	35	0	26
4450	1	49	1	15	1	49	1	41	0	8
4500	1	45	1	16	1	50	1	47	0	N 4
4550	1	41	1	16	1	50	1	52	0	23
4600	1	37	1	17	1	50	1	58	0	42
4650	1	33	1	17	1	51	2	3	1	1
4700	1	28	1	18	1	51	2	8	1	20
4750	1	23	1	18	1	52	2	13	1	40
4800	1	18	1	19	1	52	2	18	1	59
4850	1	14	1	19	1	52	2	23	2	18
4900	1	10	1	19	1	51	2	28	2	38
4950	1	6	1	20	1	51	2	32	2	58
5000	1	1	1	20	1	50	2	36	3	15
5050	0	57	1	20	1	48	2	40	3	30
5100	0	53	1	19	1	47	2	43	3	42
5150	0	48	1	19	1	56	2	46	3	57
5200	0	43	1	18	1	45	2	49	4	12
5250	0	38	1	18	1	43	2	52	4	27
5300	0	33	1	17	1	41	2	56	4	41

A TABLE *of the Inclinations, or Heliocentrick Latitudes of the Five Primary Planets.*

Anom.	♄		♃		♂		♀		☿	
	°	′	°	′	°	′	°	′	°	′
5350	0 S	28	1 S	17	1 S	39	3 N	0	4 N	55
5400	0	23	1	16	1	37	3	3	5	10
5450	0	17	1	15	1	35	3	6	5	25
5500	0	10	1	14	1	33	3	9	5	42
5550	0	5	1	13	1	31	3	11	5	52
5600	0 N	0	1	11	1	28	3	13	6	0
5650	0	5	1	10	1	25	3	16	6	8
5700	0	10	1	8	1	22	3	18	6	14
5750	0	15	1	7	1	19	3	20	6	20
5800	0	20	1	5	1	16	3	21	6	26
5850	0	25	1	4	1	13	3	22	6	32
5900	0	30	1	3	1	10	3	22	6	38
5950	0	36	1	2	1	7	3	23	6	45
6000	0	42	1	0	1	4	3	24	6	51
6050	0	47	0	58	1	1	3	24	6	52
6100	0	52	0	56	0	58	3	24	6	53
6150	0	58	0	54	0	55	3	23	6	54
6200	1	2	0	53	0	51	3	23	6	54
6250	1	6	0	50	0	47	3	22	6	53
6300	1	10	0	48	0	44	3	21	6	52
6350	1	15	0	46	0	40	3	20	6	50
6400	1	19	0	44	0	37	3	19	6	48
6450	1	23	0	42	0	33	3	18	6	45
6500	1	27	0	39	0	29	3	17	6	41
6550	1	31	0	37	0	26	3	15	6	37
6600	1	35	0	34	0	23	3	13	6	32
6650	1	39	0	32	0	20	3	10	6	26
6700	1	43	0	30	0	17	3	7	6	60
6750	1	47	0	27	0	14	3	3	6	13
6800	1	50	0	25	0	10	3	1	6	6
6850	1	53	0	22	0	6	3	0	6	1
6900	1	56	0	20	0 N	2	2	57	5	56
6950	1	59	0	17	0	6	2	53	5	51
7000	2	2	0	15	0	9	2	52	5	43

A TABLE *of the Inclinations, or Heliocentrick Latitudes of the Five Primary* Planets.

Anom.	♄		♃		♂		♀		☿	
	°	'	°	'	°	'	°	'	°	'
7050	2 N	5	0 S	12	0 N	12	2 N	50	5 N	35
7100	2	7	0	10	0	16	2	47	5	26
7150	2	9	0	7	0	20	2	43	5	17
7200	2	11	0	5	0	24	2	40	5	8
7250	2	13	0	2	0	28	2	37	5	0
7300	2	15	0 N	1	0	32	2	33	4	50
7350	2	17	0	3	0	36	2	29	4	41
7400	2	19	0	5	0	40	2	25	4	31
7450	2	21	0	8	0	43	2	18	4	24
7500	2	23	0	10	0	46	2	10	4	18
7550	2	24	0	12	0	49	2	5	4	10
7600	2	24	0	15	0	52	2	0	4	1
7650	2	25	0	17	0	55	1	54	3	52
7700	2	26	0	20	0	58	1	48	3	49
7750	2	26	0	22	1	1	1	42	3	34
7800	2	27	0	25	1	3	1	36	3	25
7850	2	28	0	27	1	6	1	30	3	15
7900	2	28	0	30	1	8	1	24	3	5
7950	2	29	0	32	1	10	1	19	2	55
8000	2	30	0	34	1	12	1	15	2	44
8050	2	29	0	36	1	14	1	10	2	35
8100	2	29	0	38	1	16	1	5	2	25
8150	2	28	0	40	1	18	1	0	2	16
8200	2	27	0	42	1	20	0	54	2	6
8250	2	26	0	44	1	22	0	48	1	57
8300	2	26	0	46	1	24	0	41	1	47
8350	2	25	0	48	1	26	0	34	1	38
8400	2	24	0	50	1	28	0	27	1	28
8450	2	24	0	52	1	30	0	20	1	19
8500	2	23	0	54	1	33	0	13	1	8
8550	2	22	0	56	1	35	0	7	0	59
8600	2	20	0	57	1	37	0	1	0	50
8650	2	19	0	59	1	39	0 S	7	0	40

A TABLE *of the the Inclinations, or Heliocentrick Latitudes of the Five Primary* Planets.

	♄		♃		♂		♀		☿	
Anom.	°	'	°	'	°	'	°	'	°	'
8700	2	N 17	1	N 1	1	N 40	0	S 13	0	N 31
8750	2	15	1	2	1	42	0	20	0	22
8800	2	13	1	4	1	43	0	27	0	12
8850	2	11	1	5	1	44	0	34	0	3
8900	2	9	1	7	1	44	0	41	0	S 6
8950	2	7	1	8	1	45	0	46	0	15
9000	2	5	1	9	1	46	0	50	0	25
9050	2	3	1	10	1	46	0	56	0	34
9100	2	1	1	11	1	47	1	2	0	43
9150	2	0	1	12	1	47	1	9	0	51
9200	1	57	1	13	1	48	1	15	0	59
9250	1	53	1	14	1	49	1	22	1	7
9300	1	50	1	15	1	50	1	29	1	15
9350	1	47	1	16	1	50	1	36	1	24
9400	1	44	1	16	1	51	1	42	1	33
9450	1	41	1	17	1	51	1	45	1	42
9500	1	37	2	17	1	52	1	48	1	54
9550	1	34	1	17	1	52	1	53	2	2
9600	1	30	1	18	1	52	1	58	2	11
9650	1	27	1	18	1	52	2	4	2	19
9700	1	24	1	18	1	51	2	9	2	28
9750	1	20	1	18	1	51	2	13	2	37
9800	1	17	1	19	1	51	2	18	2	45
9850	1	13	1	19	1	51	2	22	2	54
9900	1	9	1	19	1	50	2	26	3	2
9950	1	5	1	19	1	50	2	31	3	9
10000	1	1	1	20	1	50	2	36	3	15

A TABLE *for converting of the* Anomalies *into Signs, Degrees and Minutes,* & contrà.

Signs	Parts
1	833
2	1667
3	2500
4	3333
5	4167
6	5000
7	5833
8	6667
9	7500
10	8333
11	9167
12	10000

Deg.	Parts	Min.	Parts.	Min.	Parts.
1	28	1	0	31	14
2	56	2	1	32	15
3	83	3	1	33	15
4	111	4	2	34	16
5	139	5	2	35	16
6	167	6	3	36	17
7	194	7	3	37	17
8	222	8	4	38	18
9	250	9	4	39	18
10	278	10	5	40	19
11	306	11	5	41	19
12	333	12	6	42	20
13	361	13	6	43	20
14	389	14	6	44	20
15	417	15	7	45	21
16	444	16	7	46	21
17	472	17	8	47	22
18	500	18	8	48	22
19	528	19	9	49	23
20	556	20	9	50	23
21	583	21	10	51	24
22	611	22	10	52	24
23	639	23	11	53	25
24	667	24	11	54	25
25	694	25	12	55	25
26	722	26	12	56	26
27	750	27	13	57	26
28	778	28	13	58	27
29	806	29	13	59	27
30	833	30	14	60	28

EXAM-

EXAMPLES.

Anno 1725, *April* 26, I find the Earth's Anomaly to be 3545; which I reduce into Signs, Degrees and Minutes thus:

Earth's Anomaly	3545
Four Signs ſub.	3333
Remains	212
7 Degrees ſub.	194
Remains	18
38 Minutes ſub.	18
Remains	0

Anſwer, 4 S. 7° 38′

Note, That you always take the neareſt leſs in the Table.

Example in ♄. The ſame Day his Anomaly is 600

21 Degrees ſub.	583
Remains	17
36 Minutes ſub.	17
Remains	0

Anſwer, 0 S. 21° 36′

Example in ♃. The ſame Day his Anomaly is 4059

Four Signs ſub.	3333
Remains	726
26 Degrees ſub.	722
Remains	4
8 Minutes ſub.	4
Remains	0

Anſwer, 4 S. 26° 8′

The Tables of *Inclinations* are made by this Analogy:
As Radius,
To the Sine of the greateſt Inclination of the Planet,
So is the Sine of the Planets Diſtance from the Node,
To the Sine of the preſent Inclination, or Heliocentrick Latitude.

The Time when ♄ becomes Retrograde.		♄ Longitude.			♄ Latitude.				*Time between one Retrograd. and another.*		Days Retrograde.	Degrees Retrograde.		Sun's Place.		
			°	'	°	'			Y.	D.		°	'	°		'
1690 *Feb.* 14,	R. Orient.	♏	17	58	2	9	N	D	1	12	143	6	40	6	♓	1
1691 *Feb.* 26,	R. Orient.	♏	29	27	1	55	N	D	1	12	142	6	39	18	♓	17
1692 *Mar.* 10,	R. Orient.	♐	10	49	1	37	N	D	1	12	142	6	39	0	♈	58
1693 *Mar.* 22,	R. Orient.	♐	22	6	1	16	N	D	1	12	141	6	38	12	♈	34
1694 *Apr.* 2,	R. Orient	♑	3	22	0	53	N	D	1	12	141	6	37	23	♈	6
1695 *Apr.* 14,	R. Orient.	♑	14	41	0	26	N	D	1	12	141	6	37	4	♉	33
1696 *Apr.* 26,	R. Orient.	♑	26	7	0	1	S	A	1	12	141	6	39	16	♉	54
1697 *May* 6,	R. Orient.	♒	7	41	0	29	S	A	1	12	143	6	40	26	♉	16
1698 *May* 20,	R. Orient.	♒	19	29	0	56	S	A	1	12	139	6	42	9	♊	26
1699 *June* 1,	R. Orient.	♓	1	31	1	21	S	A	1	12	141	6	44	20	♊	39
1700 *June* 13,	R. Orient.	♓	13	50	1	42	S	A	1	14	141	6	46	2	♋	48
1701 *June* 27,	R. Orient.	♓	26	32	2	0	S	D	1	14	139	6	50	15	♋	53
1702 *July* 11,	R. Orient.	♈	9	34	2	29	S	A	1	16	137	6	51	28	♋	59
1703 *July* 27,	R. Orient.	♈	22	42	2	37	S	A	1	11	133	6	51	14	♌	4
1704 *Aug.* 7,	R. Orient.	♉	6	7	2	34	S	A	1	13	135	6	53	25	♌	2
1705 *Aug.* 22,	R. Orient.	♉	19	55	2	26	S	A	1	17	136	6	57	7	♍	2
1706 *Sept.* 6,	R. Orient.	♊	3	55	2	7	S	A	1	14	134	6	59	24	♍	1
1707 *Sept.* 20,	R. Orient.	♊	18	3	1	40	S	A	1	1	132	6	35	7	♎	2
1708 *Octob.* 4,	R. Orient.	♋	2	41	1	7	S	A	1	14	133	6	58	22	♎	11
1709 *Oct.* 18,	R. Orient.	♋	16	55	0	29	S	D	1	14	134	6	58	5	♏	55
1710 *Nov.* 1,	R. Orient.	♌	1	2	0	9	N	A	1	15	134	6	58	19	♏	45
1711 *Nov.* 16,	R. Orient.	♌	14	57	0	47	N	A	1	12	135	6	57	4	♐	38
1712 *Nov.* 28,	R. Orient.	♌	28	36	1	21	N	A	1	14	135	6	56	17	♐	37
1713 *Dec.* 12,	R. Orient.	♍	11	58	1	49	N	A	1	12	135	6	53	1	♑	38
1714 *Dec.* 24,	R. Orient.	♍	25	00	2	12	N	A	1	12	137	6	53	13	♑	38
1716 *Jan.* 5,	R. Orient.	♎	7	2	2	27	N	A	1	12	138	6	48	25	♑	37
1717 *Jan.* 17,	R. Orient.	♎	20	10	2	28	N	D	1	12	139	6	40	8	♒	38
1718 *Jan.* 29,	R. Orient	♏	1	35	1	35	N	A	1	12	139	6	43	20	♒	31
1719 *Feb.* 10,	R. Orient.	♏	12	28	2	29	N	A	1	13	140	6	40	2	♓	22
1720 *Feb.* 23,	R. Orient.	♏	25	30	2	20	N	D	1	9	140	6	40	1	♓	9
1721 *Mar.* 3,	R. Orient.	♐	6	46	1	59	N	A	1	13	143	6	39	23	♓	52

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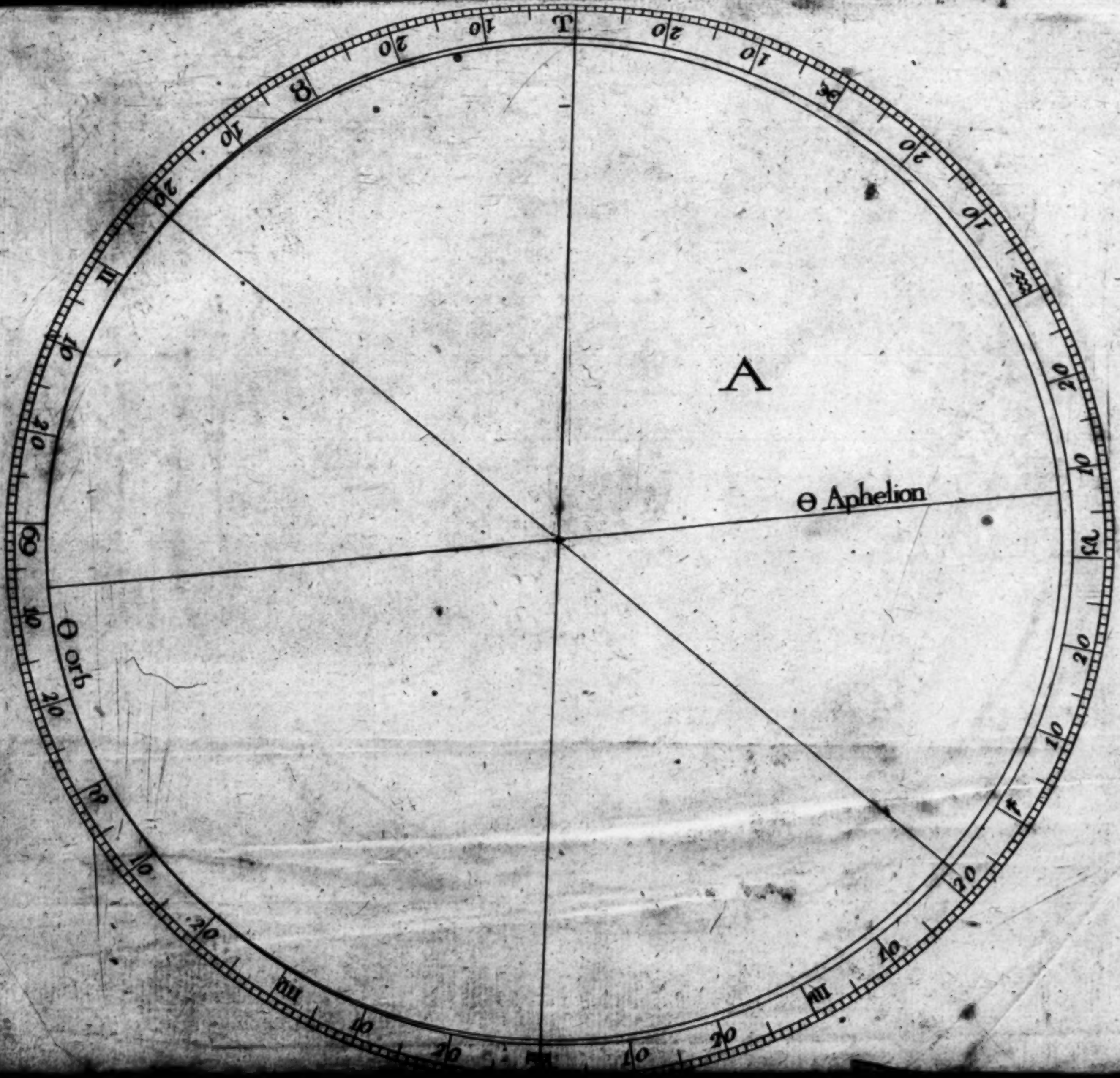
The

Time when ♃ becomes Retrograde.	♃ Longitude			♃ Latitude.			Time between each Retrogration.		Days Retrogr.	Degrees Retrograde.		☉'s Place when Jupiter becomes Retrog.
		°	′	°	′		Y.	D.		°	′	
1688 *May* 3, R. Orient.	♑	26	34	0	14	S A	1	36	122	9	52	23 ♉ 33
1689 *June* 8, R. Orient.	♓	1	12	1	1	S A	1	39	120	9	52	27 ♊ 43
1690 *July* 17, R. Orient	♈	7	32	1	35	S D	1	37	116	9	56	4 ♌ 37
1691 *Aug.* 23, R. Orient.	♉	14	24	1	26	S D	1	35	120	10	1	9 ♍ 57
1692 *Sept.* 27, R. Orient.	♊	20	21	0	37	S D	1	33	117	10	4	15 ♎ 0
1693 *Oct.* 30, R. Orient.	♋	24	25	0	11	N A	1	32	119	10	5	17 ♏ 47
1694 *Dec.* 1, R. Orient.	♌	26	33	0	59	N D	1	31	119	10	3	20 ♐ 1
1696 *Jan.* 1, R. Orient.	♍	27	03	1	26	N D	1	29	121	10	1	21 ♑ 26
1697 *Jan.* 30, R. Orient.	♎	26	57	1	30	N D	1	30	122	9	55	21 ♒ 41
1698 *Mar.* 1, R. Orient.	♏	27	6	1	11	N D	1	32	122	9	52	21 ♓ 34
1699 *Apr.* 2, R. Orient.	♐	28	20	0	29	N D	1	35	122	9	50	22 ♈ 54
1700 *May* 7, R. Orient.	♒	1	20	0	18	S A	1	38	122	9	50	27 ♉ 29
1701 *June* 14, R. Orient.	♓	6	22	0	55	S D	1	41	119	9	52	3 ♋ 31
1702 *July* 25, R. Orient	♈	14	19	1	32	S A	1	36	118	9	55	12 ♌ 23
1703 *Aug.* 30, R. Orient.	♉	20	55	1	17	S A	1	34	118	9	56	16 ♍ 56
1704 *Oct.* 3, R. Orient.	♊	26	9	0	33	S D	1	33	118	9	56	21 ♎ 7
1705 *Nov.* 5, R. Orient.	♋	29	27	0	19	N A	1	31	119	9	49	23 ♏ 57
1706 *Dec.* 6, R. Orient.	♍	0	54	1	2	N A	1	29	121	9	57	24 ♐ 12
1708 *Jan.* 4, R. Orient.	♎	1	2	1	24	N A	1	31	123	9	58	24 ♑ 32
1709 *Feb.* 4, R. Orient.	♏	0	57	1	25	N A	1	31	123	9	55	26 ♒ 44
1710 *Mar.* 7, R. Orient.	♐	1	25	1	3	N A	1	32	123	9	51	27 ♓ 30
1711 *Apr.* 8, R. Orient.	♑	3	18	0	21	N D	1	37	134	9	51	28 ♈ 45
1712 *May* 15, R. Orient.	♒	7	6	0	31	S A	1	37	119	9	51	5 ♊ 10
1713 *June* 21, R. Orient.	♓	12	51	1	14	S A	1	38	119	9	54	10 ♋ 14
1714 *July* 29, R. Orient.	♈	19	41	1	24	S A	1	38	118	9	58	16 ♌ 18
1715 *Sept.* 5. R. Orient.	♉	26	19	1	11	S A	1	33	117	10	3	22 ♍ 50
1716 *Oct.* 8, R. Orient.	♋	1	15	0	24	S D	1	32	117	10	4	26 ♎ 10
1717 *Nov.* 10, R.Orient.	♌	4	7	0	23	N A	1	29	119	10	2	29 ♏ 5
1718 *Dec.* 9, R. Orient.	♍	5	18	1	5	N A	1	32	123	10	0	28 ♐ 21
1720 *Jan.* 10, R. Orient.	♎	5	29	1	28	N A	1	28	124	10	1	0 ♒ 44
1721 *Feb.* 7, R. Orient.	♏	5	32	1	22	N A	1	32	125	9	54	29 ♒ 51
1722 *Mar.* 11, R. Orient.	♐	6	9	0	58	N A	1	34	124	9	55	1 ♈ 33
1723 *Apr.* 14, R. Orient.	♑	8	12	0	15	N D	1	35	123	9	48	4 ♉ 39
1724 *May* 19, R. Orient.	♒	12	19	0	36	S A	1	38	121	9	40	9 ♊ 6
1725 *June* 26, R. Orient.	♓	18	19	1	17	S A	1	38	119	9	54	16 ♋ 5

The time when ♂ becomes Retrograde.	♂ Longitude.			♂ Latitude.				*Time between one Retrograd. and another.*		Days Retrog.	Degrees Retrograde.		Sun's Place.		
		°	'	°	'			Y.	D.		°	'	°		'
1657 *Aug.* 25, R. Orient.	♈	21	49	4	32	S	D	2	50	65	12	47	12	♍	7
1659 *Oct.* 14, R. Orient.	♊	19	16	0	8	N	A	2	38	74	17	32	0	♍	56
1661 *Nov.* 21, R. Orient.	♋	29	52	2	40	N	A	2	34	78	19	17	9	♐	50
1663 *Dec.* 25, R. Orient.	♍	4	8	3	34	N	A	2	35	81	19	34	14	♑	3
1666 *Jan.* 29, R. Orient.	♎	7	39	3	23	N	A	2	42	81	19	1	20	♒	12
1668 *Mar.* 12, R. Orient.	♏	15	28	1	50	N	A	2	60	76	17	7	2	♈	45
1670 *May* 11, R. Orient.	♑	6	31	2	11	S	A	2	80	67	12	39	0	♊	36
1672 *July* 30, R. Orient.	♓	22	36	5	51	S	A	2	59	61	10	45	17	♌	23
1674 *Sep.* 26, R. Orient.	♊	0	3	1	26	S	A	2	40	73	16	14	13	♎	22
1676 *Nov.* 5, R. Orient.	♋	15	22	1	51	N	A	2	36	79	18	47	23	♏	57
1678 *Dec.* 11, R. Orient.	♌	21	16	3	19	N	A	2	33	80	19	32	0	♑	6
1681 *Jan.* 13, R. Orient.	♍	24	42	3	16	N	D	2	40	82	19	45	4	♒	19
1683 *Feb.* 22, R. Orient.	♎	29	53	3	8	N	A	2	50	80	18	14	14	♓	13
1685 *Apr.* 13, R. Orient.	♐	14	23	0	18	N	D	2	76	73	15	10	3	♉	59
1687 *June* 28, R. Orient.	♒	20	55	5	46	S	A	2	70	63	10	20	16	♋	14
1689 *Sept.* 6, R. Orient.	♉	7	27	4	24	S	D	5	50	69	14	40	24	♍	4
1691 *Oct.* 26, R. Orient.	♊	29	38	0	29	N	A	2	33	71	18	18	13	♏	14
1693 *Nov.* 28, R. Orient.	♌	8	24	2	42	N	A	2	34	79	19	42	17	♐	13
1696 *Jan.* 1, R. Orient.	♍	11	52	3	48	N	A	2	36	81	19	38	21	♑	26
1698 *Feb.* 6. R. Orient.	♎	15	44	3	32	N	A	2	46	80	19	1	28	♒	31
1700 *Mar.* 24, R. Orient.	♏	25	31	1	50	N	D	2	65	75	16	41	14	♈	50
1702 *May* 28, R. Orient.	♑	21	20	3	33	S	A	2	78	64	11	29	17	♊	3
1704 *Aug.* 14, R. Orient.	♈	9	50	5	9	S	A	2	53	63	11	52	2	♍	6
1706 *Oct.* 6, R. Orient.	♊	11	41	0	31	S	D	2	39	74	17	23	23	♎	38
1708 *Nov.* 14, R. Orient.	♋	24	3	2	45	N	A	2	35	78	18	58	3	♐	23
1710 *Dec.* 19, R. Orient.	♌	28	55	3	29	N	A	2	34	81	19	30	8	♑	30
1713 *Jan.* 22, R. Orient.	♎	2	17	3	31	N	A	2	41	81	19	9	13	♒	39
1715 *Mar.* 4, R. Orient.	♏	9	0	2	17	N	D	2	55	78	17	36	24	♓	20
1717 *Apr.* 28, R. Orient.	♐	26	49	1	12	S	A	2	80	72	13	29	18	♉	42
1719 *July* 17, R. Orient.	♓	9	36	6	3	S	A	2	62	61	10	10	4	♌	36
1721 *Sept.* 17, R. Orient.	♉	21	7	2	13	S	D	2	79	71	15	22	5	♎	12
1723 *Nov.* 1, R. Orient.	♋	9	16	1	32	N	A	2	33	75	18	25	19	♏	35
1725 *Dec.* 4, R. Orient.	♌	16	11	3	8	N	A	2	35	81	19	30	23	♐	35
1728 *Jan.* 8, R. Orient.	♍	19	38	3	33	N	D	2	41	81	19	30	28	♑	45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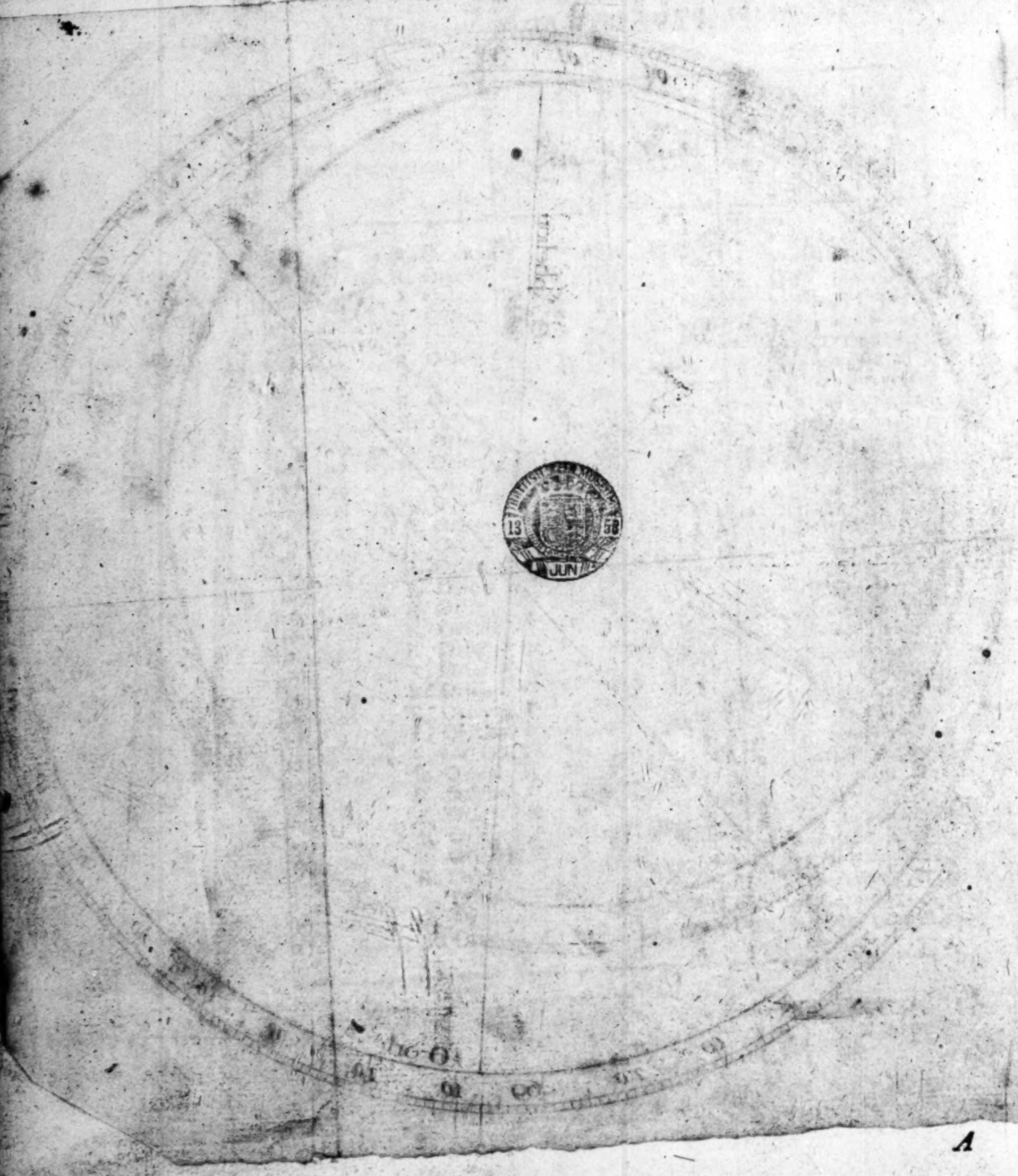

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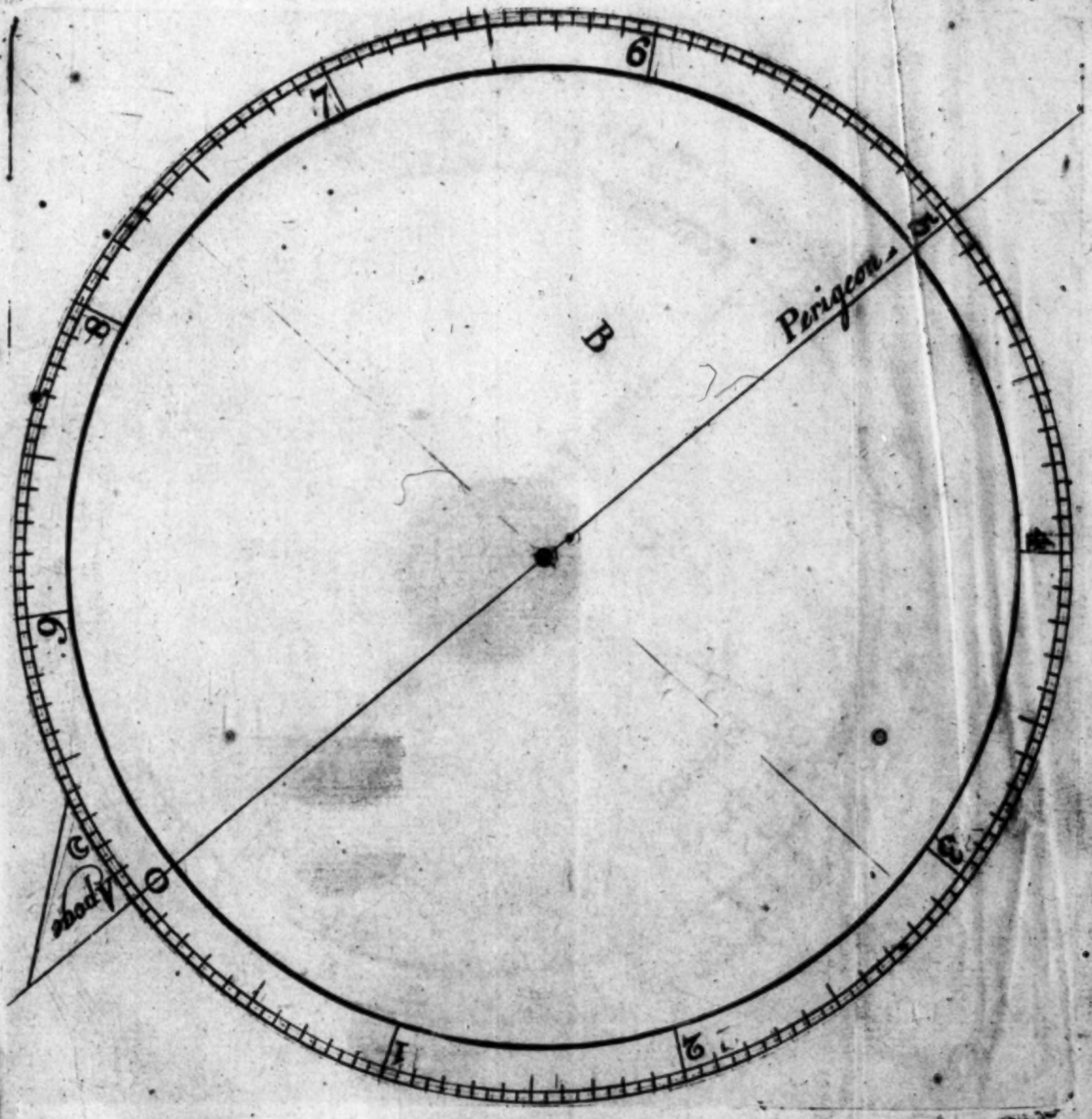
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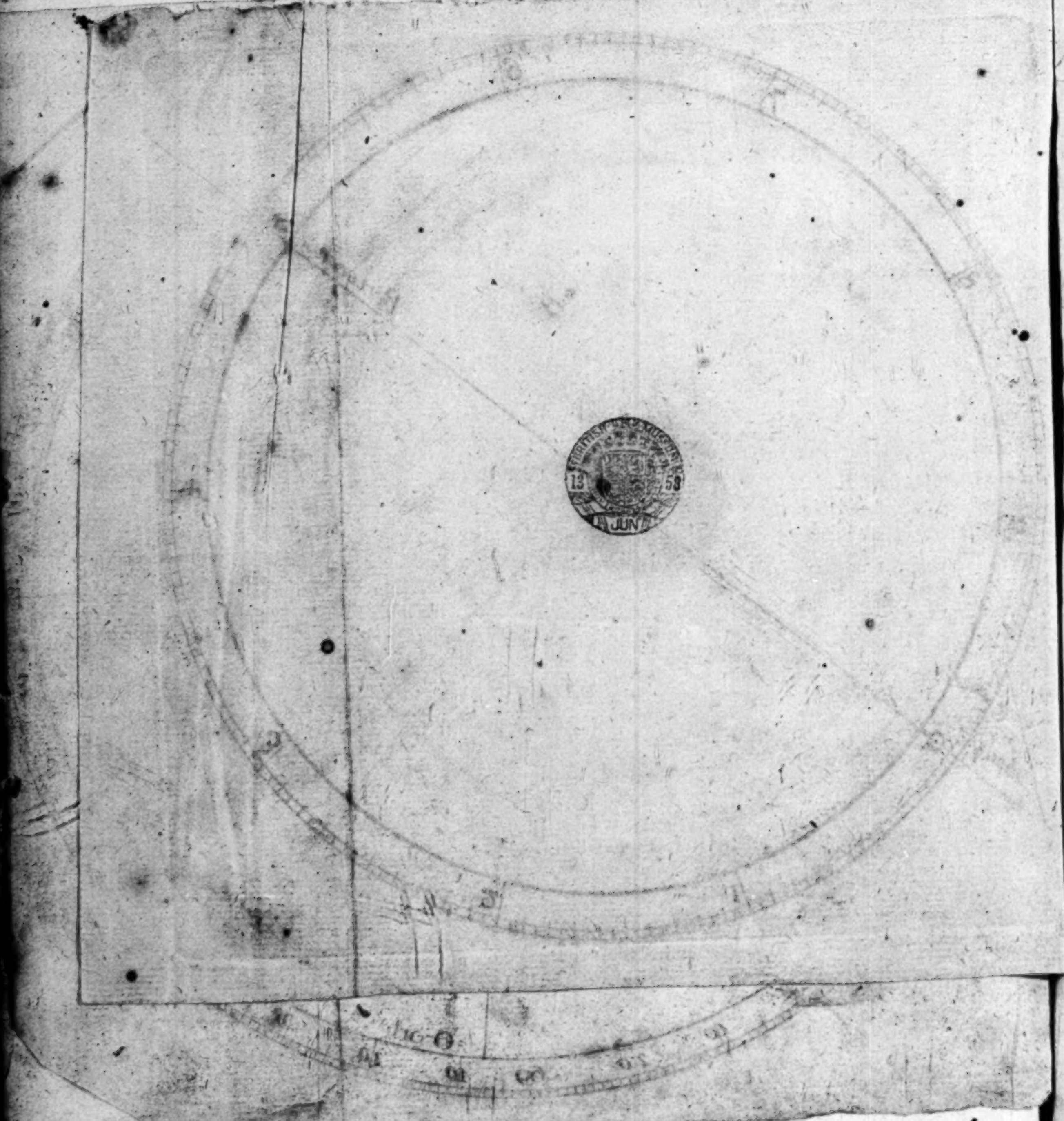

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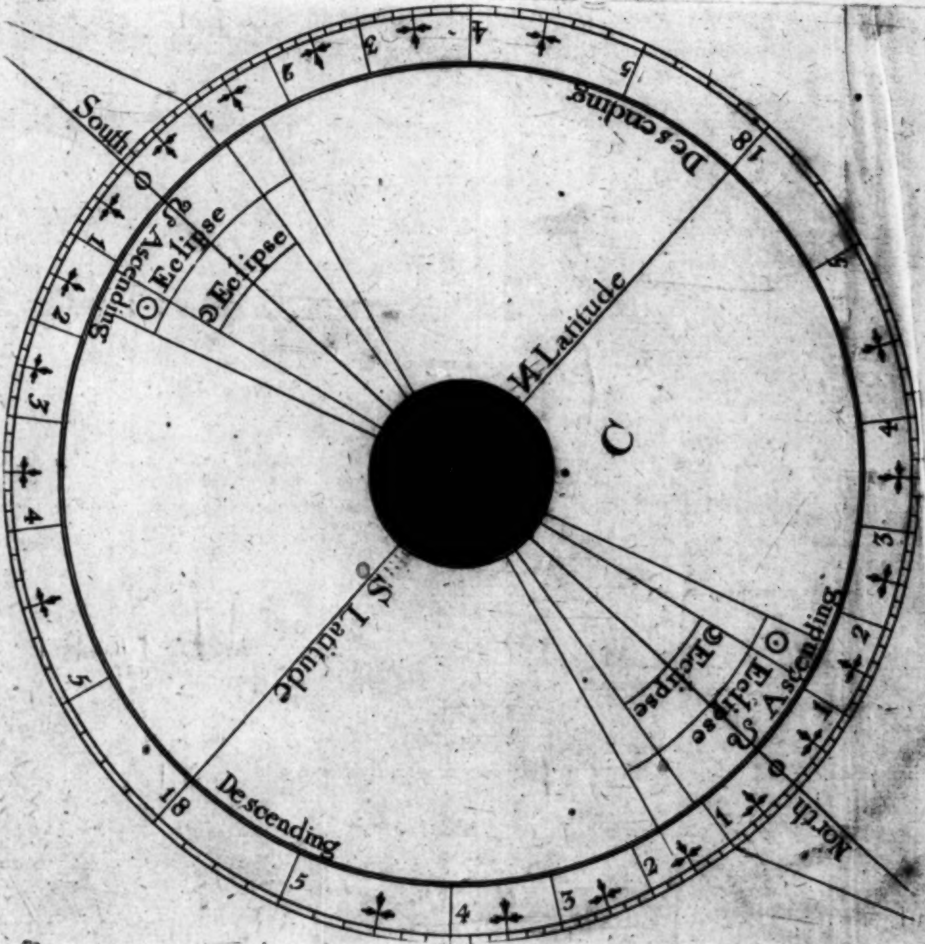
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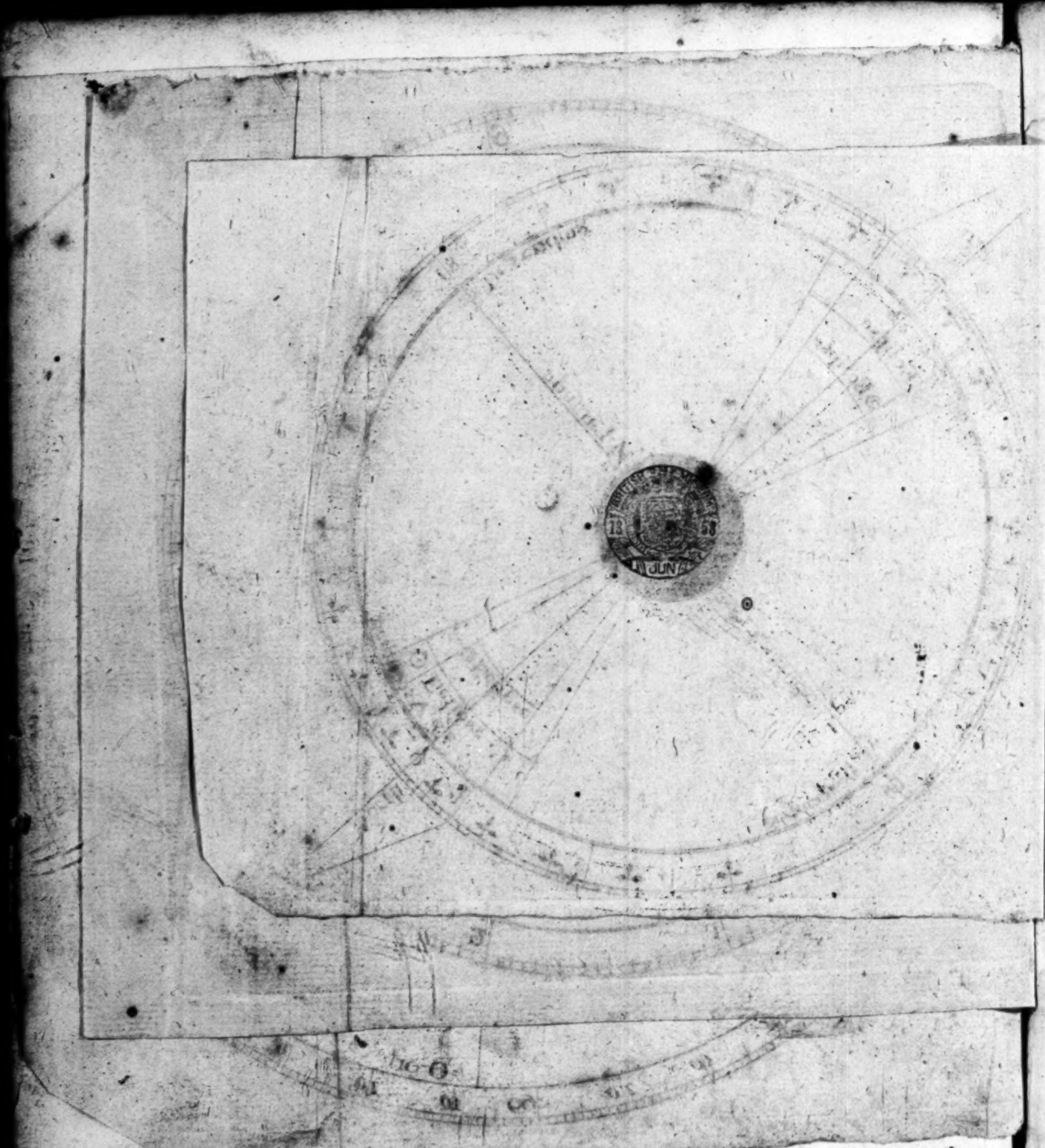13 JUN 58

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